The
Electrical Review

VOL. CXX APRIL 9, 1937. No. 3098

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements—Official Notices—Tenders—Supp. 19.

Index to Advertisers—Page xl.

Principal Contents:

	PAGE
Domestic Refrigerators	531
Country Road Lighting. By J. G. Park	534
Amending Arbitration Law. By J. W. Thomas	535
Railway Electrification in France	536
Electric Shock	537
The Ideal Home Exhibition	539
A Diesel-electric Driven Pilot Cutter	540
Local Storage Heating. By W. L. Shand	541
Empire Broadcasting	542
Meetings and Discussions	543
New Apparatus and Devices	545
Conditions in the United States	547
Business and Industrial Notes	548
Electricity Supply	552
Traction	553
Communications	554
Contract Information	555
Notes	556
Our Personal Column	557
Financial Section	559
Published Specifications	563
New Work for Contractors	564

Domestic Refrigeration

UNTIL a few years ago the domestic refrigerator was a *rara avis* in this country. We had observed the progress made in the United States, but agreed that in this direction, as in many others, "conditions were different." We may remark, in parenthesis, that last year two million domestic refrigerators were sold in the United States their value being given as $328 million. In 1935 household refrigerators valued at $9.4 million were exported, apparatus to the extent of $897,000 being sent to this country.

The American manufacturers, looking for overseas markets for their surplus products, between ten and twelve years ago, cast their eyes upon Great Britain and proceeded to create a desire for refrigerators in the mind of the British housewife. Swiss and Swedish concerns were also active at this time. They were more or less successful, but their prices were such as to limit their appeal to a small section of the population.

British producers, although early in the field (we remember a good example introduced about fifteen years ago), did not make much headway for a considerable time.

The introduction of hire-purchase schemes for small refrigerators, coupled with intensive propaganda, eventually enabled the refrigerator to be seriously considered as a domestic appliance, but still it was not available to the masses.

Gradually, however, the supply authorities became interested in the possibilities, with the result that three or four years ago things began to move. The activities of the gas companies stimulated this movement and today the refrigerator, if not yet considered an absolute necessity, is ceasing to be regarded as an expensive luxury.

This year's special effort by the British Electrical Development Association is directed towards the popularisation of the refrigerator. With the aid of a number of manufacturers, the Association is conducting an intensive Press campaign from March to September, supported by a mass of special publicity matter designed particularly for local use by electricity supply authorities. This includes advertisement stereos, posters and poster stamps, window displays and a "cold cookery" recipe book.

The methods of publicity available to the supply undertaking are manifold. In addition to those mentioned above pamphlets can be included with supply accounts and follow-up leaflets given with the receipt; exhibitions, films and "cold-cookery" demonstrations can be given. One undertaking doubled its output last year by this method; lectures can be given to the staff, particularly of the showroom. One contractor we know is friendly with the local estate agents, and makes a habit of visiting all the newcomers to the district on a friendly basis. It serves as an introduction for later business visits.

June 7th to 19th (just after the I.M.E.A. Convention at Brighton) is to be a "Refrigerator Fortnight," during which period the campaign message will be hammered into the public by all the big guns of propaganda firing simultaneously.

Gas competition has been mentioned. The latest effort of our rivals in the refrigeration push is an offer to consumers to cancel the first three-months' hire-purchase payments. Even with this rebate the cost of a 2½-cu. ft. cabinet is greater than that of several electrical models of similar capacity. This fact should be stressed, together with the undoubted advantages of electricity over gas as the operating medium for refrigerators.

It is to be hoped that special attention will be paid to making contact with architects and builders to induce them to design kitchens with proper accommodation for refrigerators. In the average small modern house kitchen space is very limited and therefore valuable. This is sometimes a deterrent to the installation of a refrigerator. Part of the space usually devoted to cupboards could be arranged to house a refrigerator or the larder could be so designed as to permit of this. This space question arises also in the case of older houses and deserves particular consideration.

In this issue we deal with the latest models produced by thirty manufacturers, as a guide to supply authorities, contractors and other readers and as a contribution to the E.D.A. campaign, to which we wish all success.

The I.M.E.A. Exhibition

SPECIAL efforts are being made this year to increase the attendance at the exhibition which is an important feature of the I.M.E.A. Convention. It has already been suggested that chief engineers should endeavour to arrange for their commercial assistants to see the show, from which a great deal is to be learned. Now we hear from the Electrical Development Association which is reponsible for the organisation of the display, that the I.M.E.A. will welcome visits from contractors, who can obtain admission tickets from E.D.A. While it is true that only a few representatives of the contractors will actually participate in the Convention itself, Brighton is an easy place to get to and contractors should find it worth while to take a few hours off and pay the exhibition a visit. The list of eighty exhibitors which we publish in this issue includes the names of practically all the leading manufacturers of domestic electrical appliances. There is no other annual show, not even the British Industries Fair, at which this class of equipment can be seen in such variety and its relative merits compared.

The Heavy-oil Engine

ALTHOUGH much of the progress made by the internal-combustion engine just now is due to changes from light to heavy oils as fuel, there appears to be justification for the claim made by the Diesel Engine Users' Association that the era of the oil engine is only just beginning. Compared with the field still awaiting development in transport and marine propulsion largely in conjunction with electricity (the report might have said more on Diesel-electric locomotives for shunting), industrial power generation seems a small business. It forms less than 2 per cent. of the total h.p. of the liquid-fuel engines used for all purposes in the world—a good quota originating in this country—and even in this respect we do not see how the grid is likely materially to affect the position as a whole. Supply undertakings, at any rate, are having their work cut out to compete with oil-engine plants. Some falling short of possible achievements is attributed to the losing sight of the basic function of the compression-ignition engine in turning chemical into mechanical energy. This results in wasting on devices effort and money that are not commensurate with any improvements effected. More pooling of experience and standardisation of dimensions are said to be required. It might be added that further efforts to reduce the power-weight ratio are also needed, on the lines that have already enabled engines above 20,000 h.p. to be put into service abroad.

Fires in Dressing Rooms

WHILE the use of shoddily made electrical apparatus is to be condemned on many grounds, it is probably just as dangerous to ascribe to it accidents that are clearly due to the unfitness of an appliance for a specific purpose, since this may conceal the real remedy. The risk of highly inflammable stage costumes coming into contact with unprotected glowing elements was commented on recently by the authorities in a large provincial town. It was suggested that the danger was due to a practice among members of theatrical companies of plugging into the lighting circuits their own portable electric fires and curling tongs, which were often of a cheap and inferior kind. However good the privately owned appliances might be, this would not necessarily prevent accidents of this nature. Surely the best way is to provide suitable fittings as part of the normal equipment of theatre dressing rooms, just as electric convectors and curling-tong heaters for the use of passengers are installed in the *Queen Mary*, to avoid chance of fire due to the inappropriate use of perhaps sound appliances.

Treatment for Shock

A GREAT deal of information regarding the effects of electric shock was presented in the paper read by Dr. S. W. Fisher and Mr. G. M. Harvey at a meeting of the Association of Mining Electrical Engineers this week which is dealt with in this issue. The investigations have shown the imperative need for the immediate application of first aid to the victim of shock and for the continuance of resuscitation methods for a long period if necessary. Men with knowledge of treatment for shock are essential in all industrial situations in which electricity is employed, and for this purpose the instruction card produced by the ELECTRICAL REVIEW has proved invaluable for many years.

Flame-Proof Apparatus

WHILE the cleaning of commutators and slip rings of motors operating at low or medium voltages in mines is exempted from the regulation which requires conductors to be dead when work is being carried out on them, this exception must be read in conjunction with another regulation. The latter relates the prevention of explosions, which differentiates it from the first-mentioned regulation dealing with precautions against shock. It is not in any case permissible, in safety-lamp mines, to open up for examination any live apparatus, as this introduces a risk of open-sparking. A little confusion between the two cases is indicated in a Mines Department Circular (No. 92) which draws attention to the danger attending an all-too-common practice. If inspection or adjustments cannot be made while the plant is dead, the apparatus must be removed out of the safety-lamp zone. It is equally important that before it is put back into service all metal casings shall be effectively restored to a flame-proof condition.

IRON AND STEEL

In addition to the usual features the next two issues of the

ELECTRICAL REVIEW

will contain a number of special illustrated articles on electricity in the iron and steel industry indicating the great advances recently made in this important field.

Sir John Brooke

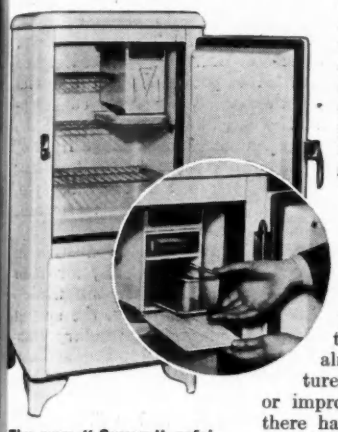
THE death of Sir John Brooke, Deputy Chairman of the Electricity Commission, will be deeply regretted throughout the electrical industry. Circumstances have brought him into increasing prominence at electricity supply functions in many parts of the country during the last year or two, and his counsel of a policy of full-measured electrical development on up-to-date lines will, we hope, continue to bear fruit. His presence and speeches will be missed at many a function, and one wonders who is going to follow with a voice of equal authority. His knowledge of electrical legislation and organisation extended over most of the post-war period, and it had been expected that his experience would have been of great value in the electrical distribution and other changes of the next few years, following as a consequence of the Government adoption of the McGowan Report. Sir John's death at the early age of 56 years is to be deplored, but emergencies in this, as in most other cases, will find us men. With the abandonment of the idea of District Commissioners, considerable strengthening of the headquarters personnel will be very necessary, inspiring confidence among all supply interests and rendering the Commissioners fully equal to the heavy duties devolving upon them in securing a fair deal all round.

Domestic Refrigerators

A review of recent improvements in design

Last year's summer was a bad one, yet refrigerator sales went up. Not only did manufacturers report a bigger turnover, but supply undertakings which had adopted a publicity programme found their efforts richly rewarded. This year, with the British Electrical Development Association actively conducting a refrigerator campaign, much more should be possible.

THE North Metropolitan Electric Supply Co. and the Wimbledon Corporation have been particularly active in the refrigerator field, having trebled their sales. The North Met. Co. informs us that a wider advertising programme is to be instituted this year, refrigerators of various sizes being available at from 2s. 6d. per week, including installation and maintenance, while at West Ham only 2s. 3d. is charged. These are two examples to illustrate what dozens of undertakings are doing. The manufacturers (about thirty altogether) are becoming equally active, their appeal being directed mainly through advertising in the popular Press, a scheme backed by E.D.A., which is arranging in conjunction with manufacturers a "Refrigeration Fortnight" from June 7th to June 19th. As is to be expected, almost every manufacturer has introduced new or improved models. Although there has been little change in design, considerable improvement in detail is noticeable and, particularly in so far as the British manufacturers are concerned, in appearance. Prices appear to have reached their lowest level, for while there have been several reductions there is a tendency for the shortage of raw materials to force them up again.



The new "Savoy" refrigerator showing the pudding dish

The gas companies' *pièce de résistance* this season is to cancel three months' payments on all orders placed before April 30th; this means a saving of £1 11s. 9d. on the cheapest model, which costs £29 10s. and has a capacity of only 2¼ cu. ft. For the same price there is the choice of almost any make of electric refrigerator with a capacity of 3¼ cu. ft.

One of the most interesting developments during the year is the British-made "Percold" (Coventry Refrigerator Co.), which is rated at 3 cu. ft. and is the cheapest on the market (22 gn.). Construction is of steel, and there is a similar model at £15 for builders for incorporation in flats. Another British machine which has been greatly improved is the "Savoy." The improvements here lie in the design of the evaporator unit, which, instead of being surrounded by cooling coils, has them placed under the first shelf and at the top and bottom. This, it is stated, enables ice to be made in 1½ hr., reduces frost formation and simplifies "cold cooking" as the glass pudding dish cooled equally top and bottom.

[*Elec. Rev.* photo.

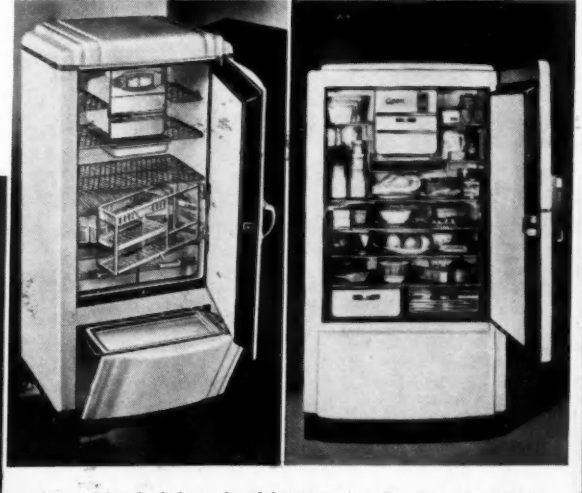
A good example of refrigerator publicity: A North Met. poster at Edmonton

An addition to the "Sternette" range is an improved 3.3 cu. ft. model incorporating an interior light and a glass dish with lid. Twelve-point temperature control is provided, and the evaporator is now placed on the left of the cabinet to provide greater shelf-storage area. A useful feature of all the "Sternette" range, which is made by L. Sterne & Co., Ltd., is the fact that universal motors are employed.

Another British-made machine is the Marco. Last year's 2 cu. ft. model, costing only 24 gns., is retained, but a new "Aristocrat" range of 3.5-7 cu. ft. models has been developed. Greatly improved appearance is noticeable, and the porcelain-enamelled evaporator unit is now situated in a top central position instead of at the side. The door now has a vegetable freshener with lid and a double-acting door fastener. The refrigerant is methyl chloride, and a return has been made to cork for the insulation.

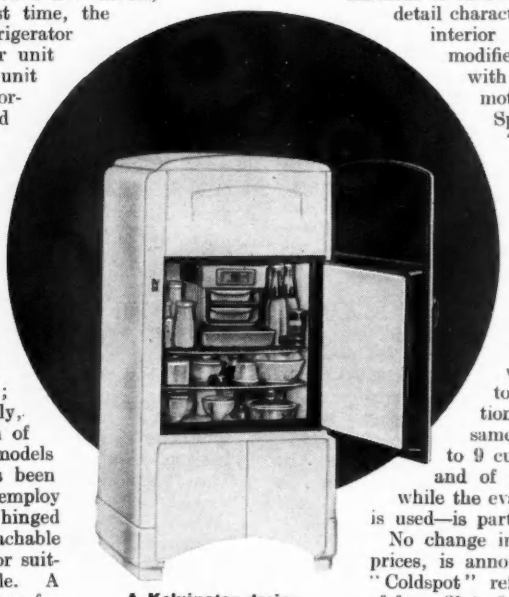
Fourteen new features are incorporated in the 1937 range of H.M.V. refrigerators. Average cabinet temperatures have been slightly reduced and, at the same time, so has the consumption, a ⅛ h.p. motor being used with a slower running rotary pump. A considerable area has been added to the coils, giving a larger cooling surface, and the thickness of insulation has been increased.

While the Kelvinator 2½ and 3 cu. ft. models remain essentially unchanged, a new 3 cu. ft. one has been added.



A combined sink and refrigerator by the Express Refrigerating Co., Ltd. (top) and (left to right) modern designs by Moffats, Ltd., Cooper-Stewart Engineering Co., Ltd., Apex-Vactric, Ltd., and L. Sterne & Co., Ltd.

The storage capacity is the same as the low-priced SU-30, but this new model (TU 354) is 12 in. higher (48 in.), has a larger shelf area, greater ice-freezing capacity and extra bottle space. The International Refrigerator Co. is continuing its "GL" series, but has introduced a new model, the FT 50. Last year, for the first time, the company introduced a 3½ cu. ft. refrigerator with a flat top and the compressor unit in the base. A modified evaporator unit is employed, although the compressor-condenser assembly is unchanged and hermetically sealed. A 5 cu. ft. model has now been added. This is of more attractive appearance (see Electrical Review, January 15th, 1937, page 102), incorporates many refinements, and has a new motor and compressor. The new range of "Stewart-Warner" refrigerators was announced last February at the Sales Convention, when the delegates voted the most important characteristics in a refrigerator as, first, reliability; secondly, appearance; and, thirdly, economy of operation. The design of the whole range, which comprises models of from 4½ cu. ft. to 8 cu. ft., has been changed. The new *de-luxe* models employ sixteen cold settings, the removable hinged "Sav-a-Step" basket, a sliding detachable tray, and a reversible evaporator door suitable for right- or left-handed people. A tilting shelf at the top provides room for bottles.



A Kelvinator design

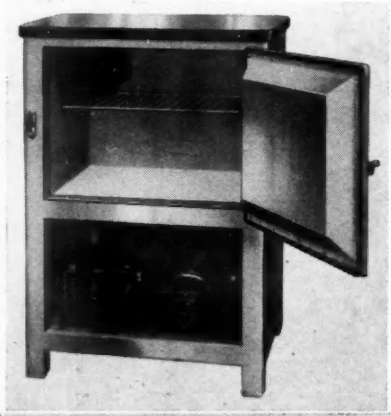
There are still three "Beach" refrigerators, sold by McGregor & McCallum, Ltd. The external appearance has been improved, and better interior equipment is provided. Another refrigerator which has undergone little change this year is the "Aerofrige" of British Electric Domestic Appliances, Ltd. The changes lie in the compressor unit, making it possible during servicing to isolate the gas in any part of the unit. The ⅛-h.p. American "Century" repulsion induction motors are being superseded by Crompton-Parkinson capacitor start induction motors.

A full range of refrigerators is now being marketed in this country by Catering Equipment, Ltd. A positive door catch, large ice cube capacity, nine-point temperature control and a particularly quiet motor are features of the "Mayflower" domestic model, which is available in 4.3, 5.5, 6.4 and 8 cu. ft. sizes. The "Empire" portable buffet on wheels (2⅛ cu. ft. capacity) is a neat little unit standing only 36 in. high.

Perhaps the most striking example of the reduction in prices is the new "Century" 4½ cu. ft. model (Century Refrigeration Co., Ltd.), priced at only 24 gn. There is a shelf area of 8 sq. ft., an ice-making capacity of 5 lb., and a ⅛-h.p. motor direct-coupled to a reciprocating compressor, which is built up and sealed in one piece with the motor housing. The cabinet is of all-steel construction. The hardware is chromium-plated brass and the shelves are finished in rustless cadmium. This machine is illustrated on page 533. Refinement in detail characterises the Moffat refrigerators. The interior shelf arrangements have been modified so that there are now a number with hinges, and ⅛ h.p. capacitor-start motors have been standardised. Special features of this year's "Chillaire" models (Orme Evans & Co., Ltd.) are the patent rotary oil-bath compressor driven by a ⅛ h.p. B.T.H. motor and a new double-helix evaporator allowing the refrigerant to come into play at both ends of the coil; defrosting is said to be unnecessary. All models are mounted on castors. The "Prestcold" range (Pressed Steel Co., Ltd.) has been redesigned with an improved appearance and to give extra low electricity consumption. The a.c. and d.c. models are the same price, and the sizes range from 3½ to 9 cu. ft. The compressor unit is new and of the belt-driven reciprocating type, while the evaporator—for which SO_2 refrigerant is used—is particularly large.

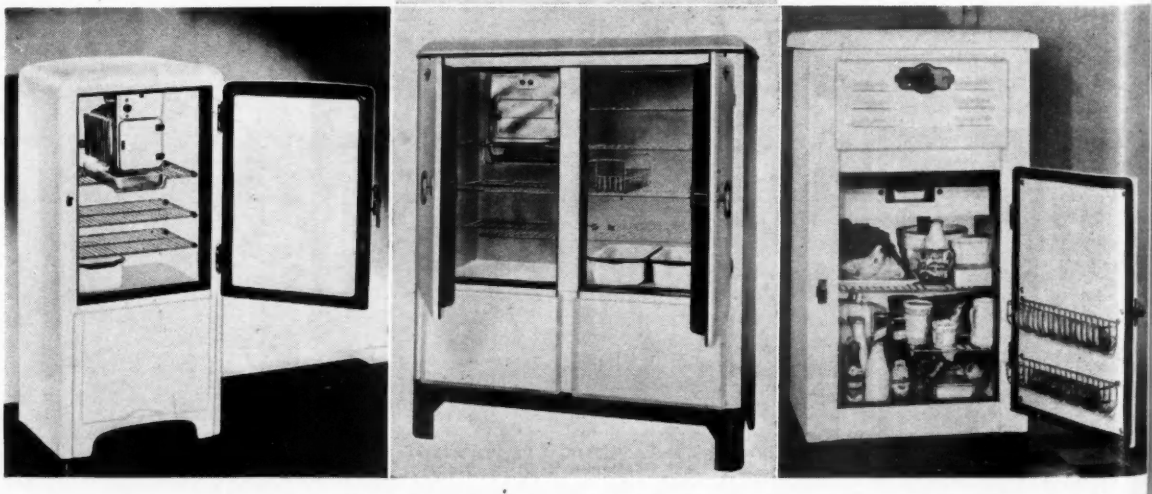
No change in design, but a large reduction in prices, is announced by Searsint, Ltd., for their "Coldspot" refrigerators. There are six models of from 3½ to 8 cu. ft. storage capacity, the special feature of all being the oil-immersed rotary compressor directly driven by the electric motor; the two are not, however, directly connected, a loose coupling being provided to eliminate vibration.

"Apex" refrigerators are now being handled in this country by Apex-Vactric, Ltd. An inner shelf is removable to facilitate the insertion of large joints, and a temperature indicator, a 15-speed freezer and semi-automatic defrosting are provided. Sizes range from 3 cu. ft. to 8 cu. ft.



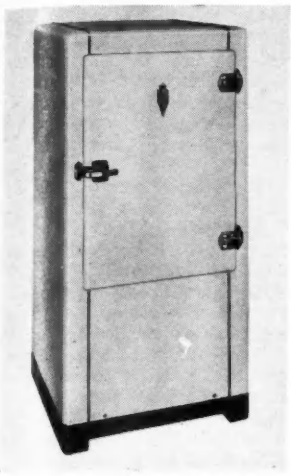
Two new Coldair machines are the "3BA" and the "5SA." The former replaces the "3CA," being the same price, but it has a capacity of 3.3 cu. ft., is somewhat higher and has a plinth base instead of feet. The "5SA" is an excellent example of the combined refrigerator, sink and draining board. The refrigerator has a capacity of 5½ cu. ft. and the height is 3 ft. 1 in. Another sink model is the type "C.S." made by the Express Refrigerating Co., Ltd. In this case the cabinet size is 3½ cu. ft. and the height is 3 ft. The whole equipment costs only £45. This company specialises in various kinds of refrigerators to meet architects' requirements for building into walls, cupboards, &c.

A redesigned "Master 3" is



Above: A 3 cu. ft. model by the Coventry Refrigerator Co. and (left to right) models by the Gramophone Co., Ltd., Coldair, Ltd., and British Electric Domestic Appliances, Ltd.

announced by Frigidaire, Ltd., who employ, in all models, "Freon" as a refrigerant. For 220/240-V a.c. a hermetically sealed rotary compressor is used for the "Master" series, but for d.c. and other a.c. supplies, as well as for the *de-luxe* range, a twin-cylinder low-speed reciprocating unit is incorporated.



A low-priced 4½ cu. ft. refrigerator by the Century Refrigeration Co.

A full range of "Crosley" machines is available from A. J. Balcombe, Ltd., in sizes from 3 cu. ft. to 7 cu. ft. All the *de-luxe* models are obtainable with hermetically sealed units. A complete range of American refrigerators is sold by the Lightfoot Refrigeration Co., Ltd., which markets the "Westinghouse" machine. This employs a hermetically sealed unit in the base cooled by forced draught. A thermometer is now incorporated in the food department. There are also a triple food service set in blue china, built-in compartments, and an automatic safety cut-out for overload protection.

Improvements in insulation and mechanical operation are stated to have increased the efficiency by 30 per cent. over previous designs.

The four "Grunow" models marketed by Rotapex, Ltd., remain unchanged, with capacities of 5, 6½, and 8 cu. ft., while there is also no alteration in the Leda Electric 5 cu. ft. domestic model and the "Universal" machine of L. G. Hawkins & Co. We are informed that the "Servel" (Utilities, Ltd.) and "Zerozone" refrigerators are no longer being made.

The Sparton Refrigeration Co., is marketing this year a range of eleven models from a 2¼ cu. ft. size up to 9 cu. ft. Features of the *de luxe* range are an electric de-frosting clock above the door, a vegetable bin in the base, and racks for eggs, fruit, &c., on the door, and (except model D. 467) six glass jars.

A de-luxe model Sparton refrigerator

All the foregoing refrigerators operate on the compressor and evaporator principle, but there are three manufacturers who employ the absorption principle. The "Electrolux" is perhaps the best-known example of this, but it is now made only for export; the same principle is employed by the "Zeros" (Ismay Refrigerating Co., Ltd.). A new "Zeros" design is a combined sink and 3 cu. ft. model in stainless steel, while kitchen cabinet units can also be obtained. The latter are a speciality of Kitchendom, Ltd., who, while mainly kitchen cabinet manufacturers, are also making a built-in kitchen cabinet and refrigerator operating on the absorption principle. Although the combination with sinks has been developed by three makers, there does not, as yet, appear to be any very great tendency in this direction. These combined models must be looked upon generally as an example of what can be done where required.

Oil-electric Power

A GENERAL review of the development of Diesel engines during 1936 (bulletin, 1936—S138) is contained in a report which is to be presented before the Diesel Engine Users' Association in London on April 14th.

This document points out that 120 firms are making oil engines and that "a kind of saturation point" has been reached. The aggregate capital invested in, or loaned to, the British oil engine industry and its specific ancillary manufacture is £75 million. The production cost is not less than £3 10s. per h.p. against a current selling price of little more than £4. The capacity of British makers is about 10 million h.p., or nearly one-tenth of the world's annual requirements. Major progress is due to change-over from petrol to oil fuel (at present a ratio of three to one).

It is admitted that power generation by oil engines has suffered many set-backs, and in a reference to the Central Electricity Board's functions the bulletin contends that . . . "it is not fair to attempt to destroy ruthlessly and unscrupulously an industry which in the early stages of development gave much help . . . the desire is not for preferential treatment, but merely fair play and results on merit; a simple policy, but defeated very largely through lack of co-ordination in the right direction within the industry."

As to fuel, even the suppliers are hesitant about continuity and consistency of supply, or stability of prices.

An outstanding example of progress with regard to output per engine is the 8-cylinder 214 r.p.m., 3,500 b.h.p., 2-stroke, "Fullagar" type opposed piston engine directly coupled to an alternator. British progress compares unfavourably with Continental achievements, namely (*a*) the 8-cylinder 115 r.p.m., 22,500 b.h.p. double-acting, two-stroke engine, installed in the electricity supply station in Copenhagen and (*b*) one of several 6-cylinder 214 r.p.m., 13,700 b.h.p. double-acting, two-stroke engines, installed in the tramways power station in the French Concession at Shanghai.

A further example of high powered engines is the 16-cylinder 214 r.p.m., 3,200 b.h.p., four-stroke, pressure-charged, vis-a-vis horizontal engine for the Jerusalem power station. The rotary pressure chargers are motor-driven, and are to be used intermittently as the "peaks" occur in the daily service. The arrangement is extremely flexible, and a very low fuel consumption can be maintained over a wide range of load. Similar engines are installed at Denham (Bucks.) film studios (six 4-cylinder vis-a-vis sets, 214 r.p.m., 1,250 b.h.p., four-stroke) and horizontal engines of the 4-cylinder, four-stroke, vis-a-vis type, developing 250-300 b.h.p. at 375 r.p.m. have been installed for driving electrical machinery for factories operating outside the grid area.

A notable installation is the 2-cylinder, 330 r.p.m., 120 b.h.p., four-stroke, vis-a-vis engine driving both a.c. and d.c. machines for operating the swing bridge at Kincardine-on-Forth; one of the features is the enclosed valve gear. The engine is started and stopped by remote control, and is used only when the outside source of supply is interrupted; the scheme suggests a high degree of reliability.

An interesting plant, comprising three 6-cylinder, 327 r.p.m., 550 b.h.p., generating sets, is installed on Bahrain Island, in the oil refinery power house of the Bahrain Petroleum Co. These engines work in conjunction with a 2,000 kW "pass out" steam turbine. The conditions are very onerous, shade temperature 114 deg. F., humidity 70 per cent., prevailing sand storms, bad water, and raw crude petroleum as fuel oil. Notwithstanding, each engine ran for 1,000 non-stop hours.

The design of certain vertical medium powered sets has been revised and a 6-cylinder, 375 r.p.m., 750 b.h.p., four-stroke engine has been installed in the electricity supply station at Gibraltar. A very interesting 6-cylinder 300 r.p.m., 540/630 b.h.p., four-stroke convertible gas/oil engine generating set has been installed for the Birmingham Tame and Rea District Drainage Board. The engine, intended to use sewage gas as fuel, is arranged for quick conversion to the use of oil fuel.

Among vertical designs two notable installations were for the film industry, one consisting of three sets collectively developing 1,400 b.h.p., and the other of four sets together developing 1,800 b.h.p. The Mogden works of the West Middlesex main drainage scheme is one of the largest installations of convertible sets developing 650 b.h.p. as oil engines and 550 b.h.p. on methane gas.

A Diesel engine with all its auxiliary apparatus mounted on a truck which can be readily attached to, or detached from, a train on which a part of the transmission gear is mounted is really an electricity generating plant which supplies energy to motors mounted on the train. Power is also transmitted to one or more of its own axles to enable it to run under its power, but a larger proportion of the power generated can be developed at the wheels of the train. The most notable example of this method of working is on the Buenos Aires Great Southern Railway in Argentina, where 1,700-h.p. mobile power plants are attached to eight-coach train sets having a seating capacity of 1,000.

Diesel-electric locomotives are in operation capable of displacing high-powered steam locomotives and of smaller power designed specially for shunting work.

The bulletin surveys the engine position relative to road vehicles and aircraft, dealing also with design, fuels and lubricants; a useful bibliography is added.

Country Road Lighting. By J. G. Park, A.M.I.E.E.

Improving existing inverted-cone reflectors

CASUAL inspection of rural street lighting up and down the country justifies the relevant recommendations to be found in the Interim Report of the Ministry of Transport Departmental Committee on Street Lighting. In particular, the restrictive policy of many local authorities in demanding the use of lamps of low wattage and of inefficient reflectors mounted on standards spaced at excessive distances is roundly condemned in the following terms. "The positioning of lamps should be studied with a view to securing the best visibility rather than uniform spacing, but normally the distance between lamps should not exceed 150 ft. . . . single side lighting should be avoided except at bends . . . . excessive glare may be avoided if care is taken in the selection and use of directive fittings."

The education of such local authorities in the matter of adequate street lighting may well appear to be an impossibility, and their ignorance supplies a weighty argument in favour of rural street lighting being controlled by a central body with legislative authority. One such Urban District Council operating within the area of supply with which I was associated, has given as its considered opinion that directional focusing fittings of very recent design result in "hiding the light under a bushel," and has expressed a preference for the naked lamp unadorned by any type of reflector which, in the words of one of the members "throws the light all round instead of covering it up"!

Those who travel extensively by road will notice one thing in particular about rural street lighting schemes, namely, the preponderance over other types of the inverted-cone reflector. For recent installations progressive authorities have seen the wisdom of providing directional fittings, but these are still sadly in the minority. It was, therefore, considered worth while to examine the former type in some detail, with a view to making modifications which would result in improved conditions.

Ascertaining Performance

Vertical cross sections were obtained of reflectors produced by various manufacturers, and curves representing them were plotted, together with the normal positions occupied by the lamp filaments. From these curves the actual performance of the reflectors was examined, the object being to ascertain graphically how the light was reflected, and thence to deduce the amount of waste in terms of the whole light reflected. Fig. 1 is an example of a half section, showing the direction of the reflected light. The surface from B to C reflects light

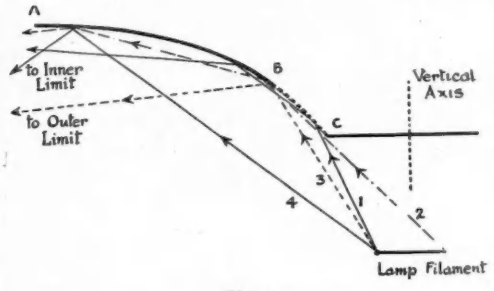
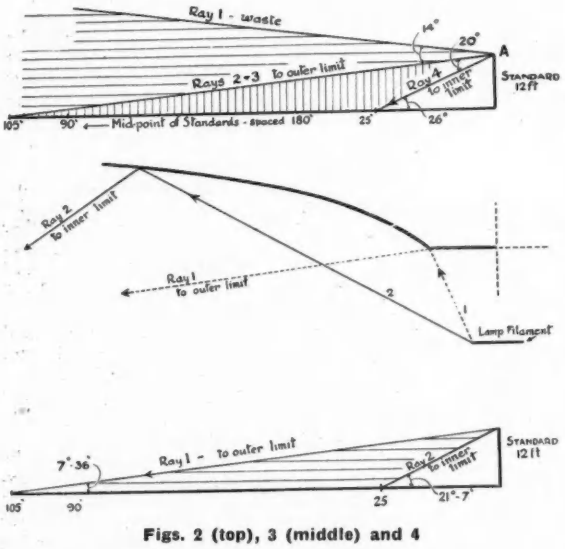


Fig. 1



Figs. 2 (top), 3 (middle) and 4

(rays 1 and 2) outside useful limits; that from B to A is useful, since ray 3 is reflected to correspond with the outer cut-off and ray 4 with the inner. Fig. 2 is a vertical cross-section through half of the cone of light emitted, in which the horizontal shading indicates the angle of wasted light and the vertical shading the angle of usefully directed light.

The unshaded area beneath the filament A shows the angle in which light is emitted unassisted by the reflector. The figures shown were the best obtained from the samples examined, using a 75-W gas-filled lamp. Of the light reflected down the length of the road, assuming a spacing of 60 yd. and a mounting height of 12 ft., a 20 deg. beam is directed usefully upon the ground, while a 14 deg. beam is sent in a useless direction, causing glare and waste. The wasted light is 41 per cent. of the whole reflected. If the spacing is reduced, a greater percentage of reflected light is wasted. Further, a cone of horizontal angle 26 deg. is left beneath the lamp to be illuminated directly by the filament; that is, the lamp is required to serve an area bounded by a circle of radius 25 ft. But on the circumference of this circle the illumination from the lamp alone, normal to the filament and 3.28 ft. above road level, is 0.115 ft.-candles. If an illumination of 0.05 ft.-candles is an adequate minimum, the area of direct illumination could be extended.

The results of illumination tests taken at various distances from the lamp were plotted, intensity against distance, first with the reflector in position and, secondly, with the reflector removed. An examination of these curves showed that the combination of lamp and reflector gave the minimum desirable illumination at a distance of 36.5 ft. from the base of the standard, while the same illumination was produced by the unaided lamp at a distance of 31 ft. from the same point.

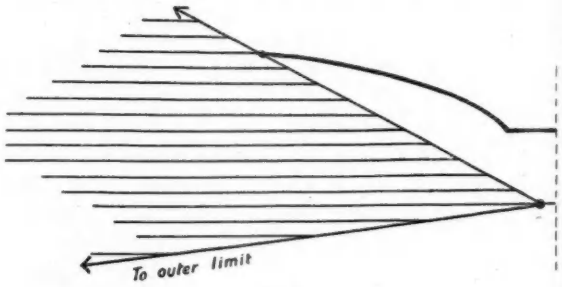


Fig. 5

Thus the reflector is of use only for a horizontal distance of 5.5. ft., for, while it increases the illumination due to the lamp above within the 31 ft. range, the increase might mofe usefully be applied outside this limit.

Maximum Efficiency

To obtain the maximum efficiency a reflector must be designed for each of a series of lamp spacings and some means of vertical movement provided whereby the filaments of lamps of different sizes may be at the same distance from the reflector. The construction of a curve of the requisite shape, given the maximum and minimum angles of reflection, corresponding to the inner and outer radius of the reflected light does not present much difficulty. An example, to suit the case considered, is: Mounting height of filament, 12 ft.; type of lamp, gas-filled; inside radius, 31 ft.; corresponding horizontal angle, 21 deg. 7 min.; outside radius, 90 ft.; corresponding horizontal angle, 7 deg. 36 min.; lamp spacing, 60 yd.

Fig. 3 shows the curve plotted to fulfil these conditions, the direction of typical rays being indicated. Fig. 4 illustrates the performance of a reflector built up from this curve, the shaded area indicating the limit of the reflected light.

The quantity of direct light from the filament that is wasted is represented by the shaded area in fig. 5 bounded on the upper side by the upper edge of the reflector and on the lower side by the spacing distance. By means of a supplementary reflecting surface this light could be directed usefully. This surface might take one of three general forms: (1) A continuation of the main reflector outwards; (2) a supplementary reflector near the lamp, with its section across the angle of waste light, designed to reflect downwards and backwards; (3) as (2), but designed to reflect upwards on to the main reflector, the light being then redirected.

An examination of these possibilities showed that only the third was feasible, and a curve was evolved which would produce a supplementary reflector suitable for use in conjunction with the range of main reflectors. This, being annular in

(*Continued at foot of next page.*)

Amending Arbitration Law.

By J. W. Thomas, B.Sc., LL.B., A.M.I.E.E.

A BILL to amend the law relating to arbitration was recently introduced into the House of Lords by Lord Askwith and passed by that House and sent to the Commons. Its object is to put an end to the practice of local authorities, companies, and others who invite tenders for the construction of public works, buildings, plant, &c., of inserting in the contract a provision that an engineer, architect or other officer or servant employed by them shall be the umpire or sole arbitrator to decide certain differences which may arise under the contract.

The principal clause states that: "Any provision in a written agreement to the effect that all or any specified differences, whether present or future, shall be submitted to arbitration so far as it provides that a party to the agreement or any engineer, architect, surveyor, officer, servant or agent employed by him shall be the umpire or sole arbitrator shall be void, and in such a case, unless the parties to the agreement agree upon a new umpire or sole arbitrator or upon one being appointed by some third party, the Court may on the application of any party to the agreement appoint a person to act as umpire or sole arbitrator in place of the person mentioned in the agreement."

On the face of it there is much to be said in favour of such a provision. It would generally be admitted that it is undesirable that an arbitrator should have an interest in the subject matter of a dispute or that he should occupy a relationship to any of the parties which might prejudice him. For one of the parties to be, in effect, a judge in his own cause is a state of affairs which is entirely repugnant to the principles of law in this country.

On the other hand, it is contended that if the parties to a contract themselves agree that an agent of one of them should act as arbitrator it can scarcely be said that an injustice is being done if that person is appointed. At the present time our courts of law will not interfere with the appointment of an arbitrator even though he is an agent of one of the parties if the relationship was known at the time of the appointment, unless it can be shown as a reasonable inference that the arbitrator had precluded himself from keeping his mind open, in which case the other party has a legal remedy.

Under Section 14 of the Arbitration Act, 1934, application can be made to the Court for leave to revoke the submission on the ground that the arbitrator appointed is not or may not be impartial, and the fact that the applicant knew of the relationship of the arbitrator with the other party at the time of the agreement will not be a ground for refusing the application. The Bill goes farther than this and makes such an agreement void, apart from any allegation of impartiality, and is designed in fact to prevent such agreements.

It is a fundamental principle of English law that there should be freedom of contract, and this principle is only modified where considerations of public policy are involved. Thus the Bill immediately raises the question whether such agreements are against public policy and whether there should be interference by law with the freedom of contract between public bodies and contractors. There are occasions when it may be desirable and acceptable to both parties that the engineer or architect of one of the parties should act as arbitrator on account of his intimate knowledge of the work in question and where both parties are quite willing to accept his decision and to trust him as an impartial person. The Bill would prevent such an arbitrator being appointed and would compel the parties to agree to the appointment of someone else, and in this respect it might create hardship.

The real cause of complaint against the agreements which the Bill is designed to render void is that engineering and building contractors have not always a free choice in the matter, but are forced to accept a clause in the contract to provide that an agent of the other party shall be the arbitrator. If they decline to agree to such a condition their chances of securing the work are reduced, if not destroyed, and thus they are compelled either to agree to it or to forgo the possibility of securing remunerative employment.

The next question, however, assuming that abuses do arise, is whether legislation is the best way of preventing them. One remedy would be for the bodies and associations representing manufacturers and contractors, instead of demanding legislation to be passed, which might have the effect of unduly limiting freedom of contract, to notify public authorities and others that their members would in future decline to tender for work under contracts which contained the objectionable clause providing for the appointment of a servant or agent as arbitrator.

It has been thought that the model conditions of contract which have been prepared by the Institution of Electrical Engineers are in line with the provisions of the Bill, but a little consideration will show that this is not the case. The arbitration clause in the model conditions states that: "If at any time any question, dispute or difference shall arise . . . . the same shall be referred to the arbitration of a person to be mutually agreed upon or failing agreement to some person appointed by . . . ." Thus it is possible for the two parties mutually to agree for an agent of one of them to act as arbitrator and the arbitration clause does not prevent this being done.

The questions raised by the Bill are of considerable importance, and its further progress through Parliament will be watched with interest.

Country Road Lighting *(Continued from preceding page)*

form, is secured to the main reflector by means of three brass rods, a half-section of the complete unit being shown in fig. 6.

It is emphasised that the foregoing design is intended primarily for conversion from existing types of inverted-cone reflectors, the upper castings to which these are attached remaining unchanged. The advantages claimed are over this type, and not over more recent directive focusing models. The supplementary reflector alone may be used in conjunction with existing reflectors, to reduce glare, though this will not necessarily result in the redistribution of the "waste" light where it is most required.

Given the right type of fitting, difficulty is experienced in special circumstances in fixing the position of the lamps. In some cases where the services are taken from underground cables, the P.O. Engineering Department has given consent for the fixing of street lamp brackets to telephone poles (subject to the observance of certain conditions), which enables the scheme to be put forward at a more competitive figure.

On the overhead section of the network there may not be a pole at a position where a lamp is required as, for example, at a cross-roads or road junction. If the conductors cross over this position, a suspension-type fitting may be utilised to save the erection of a standard. A fitting I have employed where the conductors are in vertical formation is constructed of two sections of flat galvanised iron between which are bolted reel-type insulators, by means of which the bracket is suspended from the low-voltage span. Assembly is carried out by leaning a wooden (not steel-backed) ladder against the line. The insulators are then bound in position vertically above each other on the line. The first section of the bracket is then placed in position from the back, the bolts being passed through it and the insulators. The second section is put on from the front and the whole is bolted together. The time-switch or fuse box and reflector (placed one above the other at the bottom of the fitting) can either be fitted prior to the erection or when the stage of assembly just described has been reached. The bracket, complete with all accessories adds a weight of 8.2 lb. per conductor to the low-voltage line. The wires supplying the lamp are cleated to the side of the fitting and taken into the side of the switch-box.

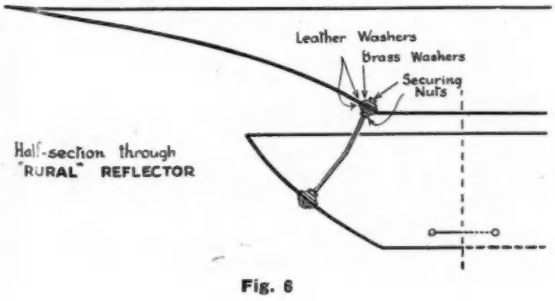
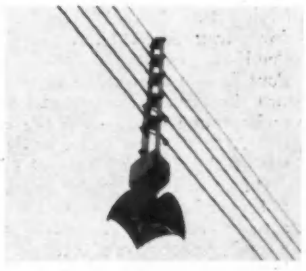


Fig. 6



"Banbridge" suspension fitting

The maintenance of lamps suspended in this manner can be carried out as easily as that of any other type, the ladder being placed against the conductors for lamp and fuse renewals and clock winding.

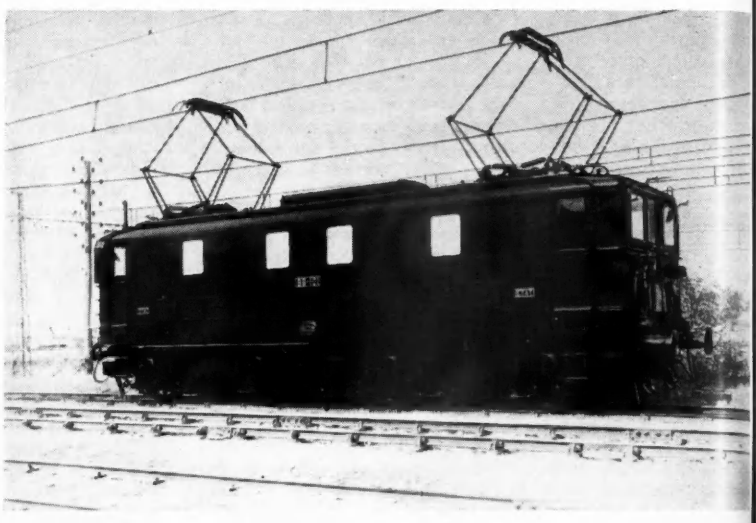
Railway Electrification in France

The conversion of the Paris–Le Mans line

THE choice of the Paris-Le Mans section of the French State Railways for the latter's first attempt at long-distance electrification was based mainly on the fact that in this region a sufficient number of feeding points already exist, and, moreover, power comes directly from the important Massif Central hydro-power plants, so that it is obtainable at cheap rates.

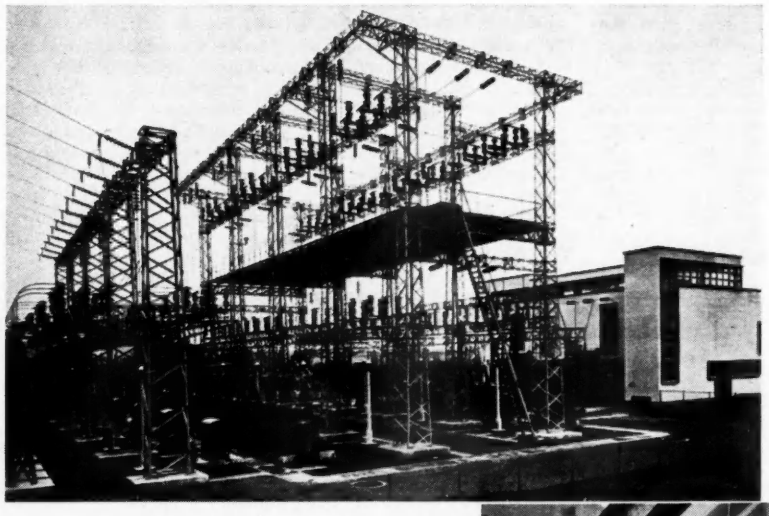
In the construction of the line a great deal was borrowed from the experience gained on the Paris-Orleans railway, which for several years has been operating electrified lines.

The permanent way over about 130 miles of the electrified stretch is served by thirteen sub-stations, a double feeder running between them. The feeders are in two sections, one between Trappes, in the Paris region, and Luisant, near Chartres, operates at 60 kV, and the second between Luisant and Arnage, near Le Mans, at 90 kV. Each is a double line and each is fed from the existing high-voltage network at three points so as to ensure security of supply.



Type BB locomotive for freight trains on the Paris-Le Mans line

The sub-stations are built slightly closer together than in previous electrification schemes, the average distance being about 10.8 miles, and the greatest distance between two sub-stations is about 12.5 miles. The two nearest the Paris end of the line, which will also serve suburban traffic, are provided with three 2,750-kW mercury-vapour rectifiers fed by transformers from existing 15,700-V lines, brought in by underground cables.



Left: The 90-kV sub-station at Condé-sur-Huisne. Below: The interior of La Loupe sub-station

The three sub-stations at La Verriere, Gazeran and Maintenon are fed overhead by 60 kV, each having two 2,000-kW rectifier groups with step-down transformers; those at Courville, La Loupe, Condé-sur-Huisne, Le Theil, Sceaux Boessé and Pont de Genes are fed at 90 kV overhead, while the two stations at Chartres and Le Mans are fed by underground cables from the stations at Luisant and Arnage respectively, at 30 kV. All energise the overhead trolley lines at 1,500 V d.c.

On sections on which speeds of more than 55 miles per hour are possible the caternary comprises a main carrier of 37 strands of bronze wire with a total cross-section of 0.179 sq. in. and an auxiliary hard-drawn copper carrier of 0.161 sq. in. cross-section. These are connected by suspenders of copper wire, spaced roughly 15 ft. apart and of such lengths that the auxiliary carrier will be free from the sag which occurs in the main carrier.

The trolley wires, two in number and of grooved hard-drawn copper, are suspended from the auxiliary carrier by spacers about 7 ft. apart and staggered. These various wires provide a cross-section equivalent to about 0.62 sq. in. of copper. Their tension is maintained by the use of counterweights, or of spring systems which can be regulated as the conditions may require.

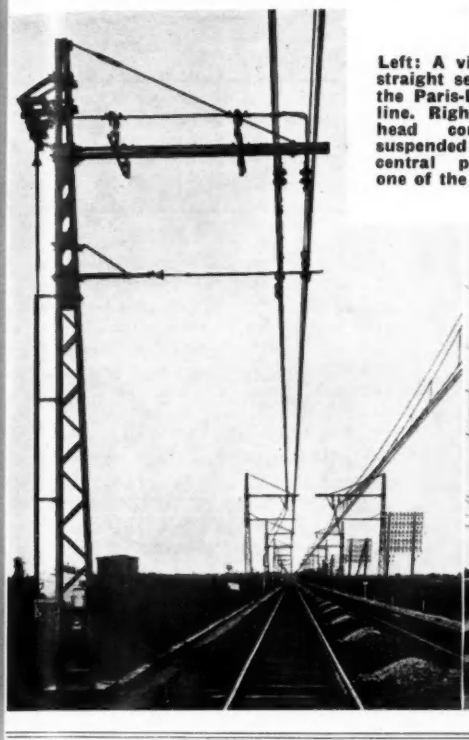
On lines on which the speed is below 55 miles per hour the auxiliary carrier is omitted, while on sidings and secondary sections intended for speeds not greater than 31 miles per hour the trolley wires alone are directly suspended from the poles.

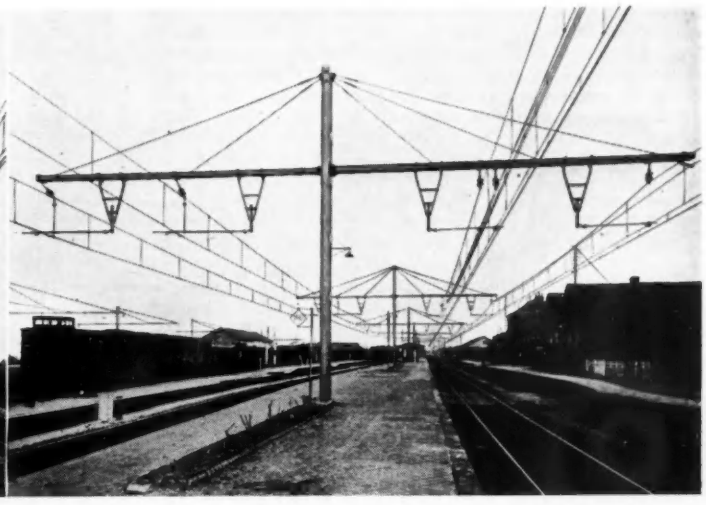
So far as the greater part of the line is concerned the poles are placed on either side of the track with each arm supporting one trolley wire. On curves, however, the poles are in positions on one side of the line only and the arms are made long enough to support both wires. In the stations single uprights set in the centre of the track have arms projecting to either side, but in some places there are two uprights, one to either side of the tracks, with a cross beam between them.

The electric rolling stock is of four types: 2-D-2 type locomotives, of which twenty-three have been ordered for passenger services on the express lines; BB locomotives, of which thirty-five have been ordered for the freight services.

motor coaches for the local lines in the rural portion, of which five are being built; and motor coaches for the suburban section of the line, of which twenty are under construction.

The two types of electric locomotives have been built on the same general lines as those now in use on the Paris-Orleans railway lines. The motor coaches are of special design. The suburban ones are of stainless steel, point welded construction, based on the American Budd cars. The main controls are operated by a cam "tree," driven by an electric motor fed from the traction circuit. The controllers have forty-two positions and it is possible to obtain an acceleration of 3.28 ft. per sec. without severe variations in effort.





Left: A view of a straight section of the Paris-Le Mans line. Right: Overhead conductors suspended from central posts at one of the stations

Electric Shock

Physiological effects and resuscitation methods

ELECTRIC shock and its effects upon the human body were dealt with in a paper by Dr. S. W. Fisher and Mr. G. M. Harvey (respectively Medical and Deputy Electrical Inspectors of Mines), which was read before the London branch of the Association of Mining Electrical Engineers on April 6th. The authors did not claim to present any original discoveries, but rather to summarise recent research into physiological and pathological effects. They explained that the passage of a sufficient current of electricity through the human body might cause:—

(*a*) Asphyxia by contraction of the respiratory muscles so as to prevent breathing, the heart continuing to beat for a little while. If such conditions persisted unconsciousness would take place very quickly due to lack of oxygen. It was therefore of the utmost importance to switch off the supply, or remove the victim from contact, and to commence artificial respiration with the least possible delay.

(*b*) Fibrillation, a condition in which the regular rhythmic action of the heart was so altered that total irregularity of the pulse resulted, no two beats being alike in force or rhythm. In a severe case no pulse might be felt and stimulation of the heart by massaging under the ribs and the left side of the chest should be done in addition to the administration of oxygen and CO_2 mixture and artificial respiration. Fibrillation appeared to be caused chiefly by small currents resulting from contact with conductors at 200 to 500 V.

(*c*) The respiratory centre was a small area, situated in the medulla oblongata of the brain, which controlled breathing. When this area was destroyed, all rhythmical respiratory movements ceased. Contact with conductors at high voltages apparently resulted more often in paralysis of this centre than in heart failure.

Not only the intensity of the effect, but the part of the organism affected, whether the heart or the respiratory system, depended upon the value of the current passing through the body, other factors being constant. With a.c. of 50 to 60 cycles the "threshold of perception," *i.e.*, the minimum current at which the senses could record any effect was one mA. The "threshold of decontrol," *i.e.*, the value at which the victim ceased to have control over his muscles, was 15 mA. The "threshold of danger to life," *i.e.*, from failure of heart, respiration or both, was given by Zimmern as 25 mA. The "threshold of fibrillation" was approximately 100 mA.

The principal conclusions formed from recent tests were that (1) the most dangerous path for the shock current was that between head and feet or hands and feet. A shock passing through the body from one foot to the other did not normally produce fibrillation. (2) For shocks lasting one second or more, the threshold current for fibrillation at 25 cycles was 25 per cent. greater than at 60 cycles, and at zero frequency (d.c.) five times that at 60 cycles. (3) Very brief shocks, lasting 0.1 second or less, rarely produced fibrillation.

The tests confirmed the fact that as the shock current was increased the danger to life increased up to a certain value, about 6A, after which it fell. Comparatively heavy currents might pass through the body without serious effect upon the heart or respiratory system, but such currents produced serious effects upon the tissues. The experiments upon "counter-shock" were striking. Sheep in which a state of fibrillation had been produced by a shock of normal intensity were, in the majority of cases, revived by the application of a second shock of higher intensity and very short duration. It was concluded that the second shock caused the heart to stop momentarily, after which it resumed its normal beat.

As a means of resuscitation in actual cases of shock such a method was impracticable, but the substitution of a physical for an electrical counter-shock formed the basis of McLaglan's system, which involved placing the victim in a sitting posture while the operator, standing behind him, pressed with his thumbs upon the nerves in the pectoral arch (the hollow at the base of the neck) and at the same time delivered a blow with his knee in the region of the seventh dorsal vertebra. An authentic case of the successful application of this method, after ordinary methods of resuscitation had failed, had come to the knowledge of the authors. There had been many cases in which a man working upon a transmission pole or staging had received a shock at high voltage and had fallen heavily to the ground and quickly recovered. While admitting the possible effectiveness of a counter-shock doctors regarded its deliberate administration as most dangerous.

The chief danger when no medical man was present was that the heart which was suspected to be fibrillating might, in fact, be beating rhythmically but very feebly. Under such circumstances the blow which stopped its beating altogether might well prove fatal, while the time lost in commencing artificial respiration must militate against the recovery of the victim. Artificial respiration was not by any means universally successful in restoring persons suffering from electric shock. Yet, in spite of all research, it remained the only method available in the ordinary cases of mining accidents where a medical expert, with the resources of a hospital beside him, was not available at the moment of the accident.

The administration of a mixture of oxygen and carbon

dioxide (93 per cent. and 7 per cent.) was most important, and should be carried out as soon as possible. The respiratory centre was stimulated and blood pressure improved. Artificial respiration could be applied with the exercise of a degree of skill easily acquired by any man trained in ambulance work and possessing patience and a cool head. Time was by far the most important factor in determining whether a man's life could be saved or not. The majority of shock accidents in mines occurred at the coal face, and valuable minutes were frequently lost by the man's mates crawling down the face to the gate end to switch off.

Remote control of coal-cutters was an advantage, otherwise an effort should be made, using dry timber or clothing, to detach the victim from the cable by which he was held. Every moment he was in contact reduced the chance of resuscitation. Once the victim was clear, artificial respiration, together with the administration of oxygen and carbon dioxide mixture, should be commenced at once and sustained for four hours, if necessary, or until the arrival of a doctor, using either Schaeffer's or Sylvester's method. The former was generally considered the easier to apply underground. In all cases the patient should be kept warm and absolutely quiet.

The current passing through the body mainly determined the effects of shock. To correlate current and voltage one must have some idea of the resistance of the path through the body. This depended upon so many factors, and varied so greatly between individuals, that it was difficult to obtain even an approximate figure.

The internal resistance of a living body was not generally greater than 1,000 ohms. A powerfully built man had a lower resistance than a man of less muscular build; also the joints, such as wrist and ankle, possessed a high resistance compared with the trunk. At low voltages the physical and chemical condition of the epidermis was important. A very dry skin raised the resistance 50 per cent. above, and a very moist skin reduced it 50 per cent. below the mean value. Tests made upon twenty-five living persons showed that breakdown of the epidermis commenced at about 20 V a.c. The resistance to d.c. was 20 per cent. to 40 per cent. greater than to a.c. Table I indicated the voltages at which effects were likely to be produced.

TABLE I.

	Applied Voltage.		
	Very moist.	Mean value.	Very dry.
Threshold of perception	2	4	6
,, decontrol	28	50	67
,, danger	45	76	100
,, fibrillation	145	200	250

The threshold current of 100 mA. was stated by four American experimenters to be just less than the lowest value at which fibrillation was found to occur. As the mean value of the current producing fibrillation in man was estimated at 260 mA., it did not by any means follow that shock voltages exceeding 250 V must necessarily produce fibrillation; otherwise cases of recovery at higher voltages would be difficult to explain, although spontaneous recovery from fibrillation was not unknown.

The authors append two other tables to their paper. The first gives details of forty-two cases of fatal shock. The other, which we reproduce, presents particulars of non-fatal accidents, and indicates the efficacy of resuscitation methods where they were employed. The voltages given in this table were the maximum possible, and, in the case of insulated neutral systems, were equal to the voltage between phases, assuming that the distributed leakage on the system was equivalent, at the moment of the accident, to a "dead earth" on one or both of the phases other than that with which contact was made. Where the value given was 500 V, therefore, it was quite possible that the actual shock voltage was very considerably lower.

TABLE II.—NON-FATAL ACCIDENTS DUE TO ELECTRIC SHOCK.

Shock received.	Maximum voltage and system.	Probable duration of contact.	Artificial Respiration.		Local conditions.	Age.	Remarks.
			Interval before application.	Duration of application.			
Hands to feet...	360 V, a.c.	A few secs.	Not required.		Dry	42	Did not lose consciousness.
,, ,, ...	500 V, a.c.	Momentary	Immediately	5–6 mins. 30	Very wet	41 26	Both men regained consciousness.
Hand to knee...	350 V, a.c.	45 secs.	Not required.		Dry	34	Did not lose consciousness.
Hand to feet	230 V, a.c.	30 secs.	,,	,,		29	,, ,, ,,
,, ,, ...	3,300 V, a.c.	3 secs.	? A few	mins.	Damp	20 43	Only the younger man lost consciousness.
Hands to knees	360 V, a.c.	25 secs.	Not required		?	—	Did not lose consciousness.
Left shoulder to left thigh ...	200 V, a.c.	1 min.	,,	,,	Dry	22	,, ,, ,, Pony in same position killed.
Palm to fingers of same hand	290 V, a.c.	3 mins.	,,	,,	,,	35	Fairly severe burns.
Hand to feet	340 V, a.c.	5 secs.	Immediately	10 mins.	Wet	35	Regained consciousness. Struck head heavily in falling.
Hand to hand	290 V, d.c.	Momentary	Not required		,,	22	Did not lose consciousness.
,, ,, ...	225 V, a.c.	,,	,,	,,	,,	26	,, ,, ,,
Hand to feet	250 V, a.c.	10 secs.	,,	,,	Damp	26	,, ,, ,,
,, ,, ...	500 V, a.c.	Momentary	,,	,,	Wet	40	,, ,, ,,
Hand to seat	2,900 V, a.c.	5 secs.	Immediately	Breathing recommenced after few secs.	Very wet	21	Fell 23 feet to ground; unconscious 24 hours. Deep gash in thigh.
Hands to feet...	300 V, a.c.	Momentary	3 mins.	30 mins.	Wet	40	
,, ,, ...	320 V, a.c.	,,	1–2 mins.	A few mins.	Dry	36	Doubtful whether injured man actually lost consciousness.
,, ,, ...	320 V, a.c.	A few secs.	2 mins.	3 mins.	Slightly damp	35 40	Elder man did not lose consciousness.
Hand to knees	360 V, a.c.	,,	Immediately	10 mins.	,,	45	Did not completely lose consciousness.
Hands to feet...	125 V, a.c.	Momentary	5 mins.	10 mins.	Dry	35	Relapsed into unconsciousness twice after revival.
Hand to hand	290 V, a.c.	1–2 mins.	Immediately	3–4 mins.	Slightly wet	28	Treatment actually consisted of massaging the back.
Hand to feet	110 V, a.c.	Momentary	3 mins.	2 mins.	Dry	27	Treatment by ambulance man consisted of kneeling on the injured man's stomach.
,, ,, ...	320 V, a.c.	2 mins.	?	2 mins.	Wet	50 35	The younger man did not lose consciousness.
Hands to knees	320 V, a.c.	1 min.	5 mins.	A few mins.	,,	31	Doubtful whether injured man completely lost consciousness.
Hands to feet...	480 V, a.c.	Momentary	2 mins.	5 mins.	,,	31	Doubtful whether injured man completely lost consciousness.
Hands to body	500 V, a.c.	,,	10 mins.	45 mins.	Dry	25	——
Hands to knees	290 V, a.c.	½ min.	Not required.		Wet	40	Lost power of speech 24 hours.
,, ,, ...	250 V, a.c.	Momentary	Immediately	1 min.	Very wet	25	Probably only dazed.

The Watford Plant Extensions

LAST Friday the new 15,000-kW Brush-Ljungstrom turbo-generator set, which brings the capacity of the Watford Corporation's generating station to 36,000 kW (see last week's issue, p. 503), was set in motion by Lord Derby. At a luncheon held at the Watford Grammar School at the conclusion of the inaugural ceremony Lord Derby congratulated the Corporation on its enterprise and said that during his lifetime the growth of the use of electricity had been little short of marvellous, and it might hold even greater possibilities in the future. Electricity was said to be labour-saving, and when he was told a thing was labour-saving he was always touched with regret since it usually meant unemployment. This, however, was not true of electricity used in the home as it helped the housewife without replacing other labour.

The Mayor, Councillor H. Coates, said that the fact that the industries of Watford were so varied was a safeguard against unemployment. Electricity available at less than a halfpenny a kWh was enabling them to keep down the smoke problem, and there were, in fact, only two or three big chimneys in the borough. Proposing the toast of the Watford electricity undertaking, Sir Dennis Herbert confessed that, although he had been averse to municipal trading, he had nothing but praise for the Watford undertaking. In about ten years the undertaking had grown five-fold. In response Alderman L. H. Andrews, chairman of the Electricity Committee, claimed that electricity under the two-part tariff was cheaper in Watford than in any other part of the country, and the borough's position as the sixth most wealthy town in England was due largely to the prosperity of the electricity undertaking.

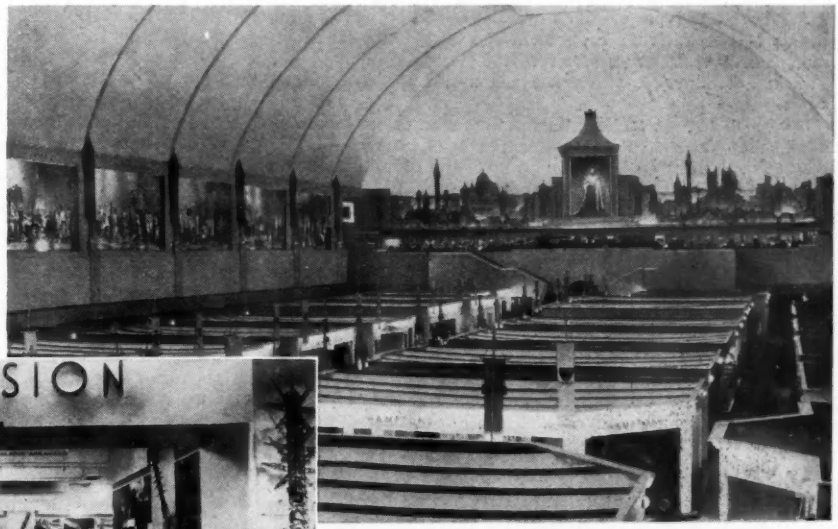
In thanking the contractors and all others connected with the extension scheme, Mr. A. W. Barham, chief engineer and general manager of the Electricity Department, referred to the use of chain grate stokers with higher grade coal than was now customary, and said that this was due to the belief that the growing employment of low-grade pulverised fuel would result in its price being raised. Mr. H. E. Midgley, chairman of the Brush Electrical Engineering Co., Ltd., in reply said that the growth of the station was phenomenal. The toast of the guests proposed by Ald. H. J. Bridger was replied to by Mr. V. Watlington, director of B.E.A.M.A.

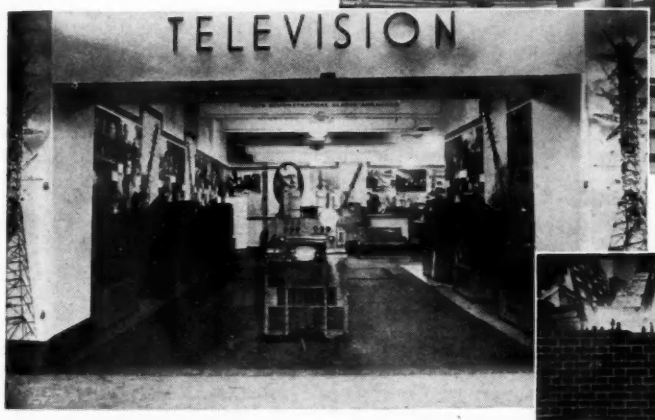
The Ideal Home Exhibition

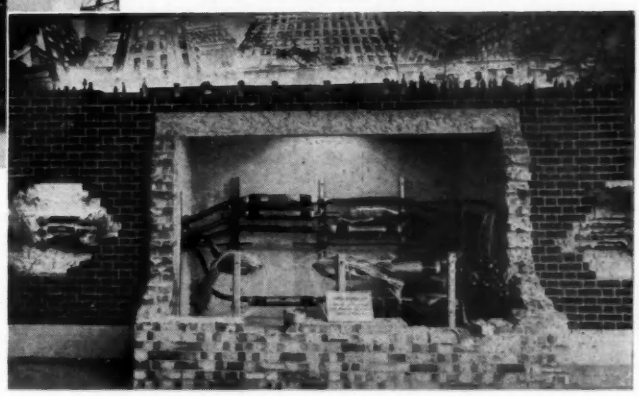
Growing interest in electric washers

ALTHOUGH the absence this year of several of the larger electrical manufacturers, and incidentally a separate Electrical Section, robs the Ideal Home Exhibition now being held at Olympia, London, of a certain amount of electrical interest, there is a good display of electrical apparatus, much of it new, to be seen at the show. This applies especially to domestic washing equipment, which appears to be becoming popular, and five manufacturers at least have new machines to show.

Developments in these new washers relate generally to improved methods of agitation, wringer release and to appearance, but a somewhat different principle is involved in the agitatorless machine of extra large capacity (9 sheets) shown by Bendix Home Appliances, Inc., which by a revolving perforated vertical drum and jets of water does the work of soaking, washing, rinsing and drying automatically, switching itself off when the work is completed. A dial regulates the temperature of the water for different fabrics. Both Beatty Bros., Ltd., and the Hurley Machine Co. (England), Ltd., have produced special "Coronation" models, outstanding features of the former company's machine being a compact streamlined stainless steel tub, a different type of gears and drive and improved draining; the appearance of the "Thor" machine with its vitreous enamel finish and "no-corner" design is specially attractive. The Hurley Co. is also demonstrating the "'Fold-a-way" ironer, which fits into a small cupboard.







The main hall of the Exhibition; (left) Television Section; and (below) replica of a G.P.O. underground cable chamber [*Elec. Rev. photos.*

The incorporation of specially curved vanes in the "Turbolator" agitator employed on some of the eight new "Easy" washers aims at giving effective washing the whole way up the tub. The suppliers, Herbert Bros., also have two new machines of the vacuum-cup type, as well as three new ironers. By employing floating agitators in its four new "Goblin" machines the British Vacuum Cleaner & Engineering Co., Ltd., claims to wash the clothes in the clean water at the top of the tub and at the same time minimise wear on the fabrics. The "Goblin Imp," taking 5 lb. of dry clothes, is attracting much interest for use in small houses and flats.

Improvements of some sort or other are noticeable in practically every other type of washer on view on the stands of Wilkins & Mitchell ("Servis"), British Electric Domestic Appliances, Ltd. ("Bedal Astoria"), Ismay Distributors, Ltd. ("Connor Thermo") and Vactric, Ltd. ("Apex-Vactric").

The last three companies also swell the number of exhibitors of vacuum cleaners, and Vactric, Ltd., which now offers five machines to choose from, has brought out a new low-priced floor polisher, sturdily built with the switch neatly embedded in the handle to obviate risk of inadvertently switching on when attending to the brushes. Accessibility of the dust-bag is the outstanding feature of the latest lightweight model by the Cooper-Stewart Engineering Co., Ltd., while the New Welbeck "All-in-one" machine, with its patent tool rack, the bagless Tellus and the varous Electrolux models all have their own points.

Cleaning, scrubbing, suction floor polishing and lawn mowing can be done with the "Columbus" four-in-one machine shown by Rollnick & Gordon, Ltd., only two or three seconds being required to convert it from one device to another. An example of a central cleaning system for houses and flats is given by Centro-Vac, Ltd., and the latest type of bakelite motor "Junior" machine is featured prominently on the two Hoover stands, on one of which can be seen some of the routine tests to ensure efficiency and reliability carried out at the company's factory.

The new "Goblin Monarch" and "Wizard" models described in our last week's issue (page 509) appear on the stand of the British Vacuum Cleaner & Engineering Co., Ltd., which in another part of the exhibition makes its entry into the electric clock market with a complete range of mains models (with a new type of movement claimed to be the simplest yet produced) and a battery clock which will run for about eight months on one battery. The twenty-seven electric clocks employed throughout the exhibition have been provided by Bulle Products, Ltd., among whose extensive exhibit appears an attractive new glass and mirror model called the "Royal." In addition to its battery clocks Orel-Micro Electric, Ltd., is featuring its battery and mains turntables for advertising displays.

Several of the leading manufacturers are not participating in the Refrigeration Section this year, but visitors have the opportunity of seeing much of the latest equipment referred to in our article on page 531. The arrangement of one of the Gramophone Co.'s stands in the form of a model kitchen, besides displaying an example of an H.M.V. refrigerator to its best advantage, provides a chance to demonstrate the company's home laundry equipment. Zeros (Sales), Ltd., whose coloured models are finding favour, shows one of its built-in sink units with stainless steel sink and draining board. Meters indicating the fact that its machines use less electricity than an ordinary reading lamp furnish a convincing selling aid for Frigidaire, Ltd.

In the modern kitchen sharp corners are undesirable and an inspection of the models of the above-mentioned manufacturers as well as such others as Apex-Vactric, Ltd.; Express Refrigerating Co., Ltd.; Moffats, Ltd.; Cooper-Stewart Engineering Co., Ltd.; British Electric Domestic Appliances, Ltd.,

and A. J. Balcombe, Ltd., indicate the care that has been taken to produce a smooth contour and at the same time reduce overall dimensions to the minimum.

Moffats, Ltd., with their attractive coloured cookers equipped with "Therm-o-matic" oven heat regulators are the sole representatives of the electric cooking industry. They are showing two ultra-modern table-top models (see p. 545). While employing paraffin as the heating medium, the "Electroleum" cooker by Vack Industries, Ltd., incorporates an electric fan to provide the necessary air pressure. Special aluminium ware for electric hot-plate cooking is a speciality of Corfield-Sigg, Ltd., which is showing "Super Merton" ware up to 175-pt. capacity. A new 3-pt. electric kettle produced by this company has an immersion-type element (950 W) with a new type of cut-out. Demonstrations are given of the Ever Ready gas lighter.

Improvements to S. Guiterman & Co.'s "Mixmaster" food preparing equipment include a more powerful motor, a better handle grip, a larger stand and a new attachment for opening tins. The latest types of coffee brewers are to be seen on the stands of the Catering Equipment, Ltd., and Duncan Watson, Electrical Engineers, Ltd., the latter company also showing a full range of electric labour-saving devices of all kinds.

Described as "an amazing factotum and an electric treasure chest," the electric cabinet introduced by Servogyro Electric Cabinets is a masterpiece of compactness and combines, among other things, a radio receiver, clock, air-conditioner, cocktail bar, kettle, mixer, bureau and a bookcase.

Two new electric irons make their *début*. A variable-weight model is an innovation by Wood Russell & Co., Ltd., while Easiwork, Ltd., is demonstrating its "Eagle" steam-electric iron, which steams while it irons and will not scorch or burn if left on inadvertently. Sewing should be a pleasure with the latest Singer and Harris machines. The Rawlplug Co., Ltd., is showing a complete range of its products and two moving exhibits indicate the strength of the fixings. The Wall Plug Co., Ltd., also demonstrates how to make firm and permanent fixings in all abrasive materials.

Among a range of "Better Vision" products, the Metalcraft Mfg. Co. (Canada) is now marketing a companion model, and its special reading lamps are available with a "Tri-lite" attachment providing three different intensities from one lamp. To meet the modern tendency in decoration and colour, Dernier & Hamlyn, Ltd., have developed a new range of "Neolux" lighting fittings. Bohemian crystal fittings, chandeliers, table standards and wall brackets in smoke, amber and rose tints are a speciality of Oswald Hollman, who is also the sole agent in this country of "Scintapearl" shades and the new "Coronet" study lamp.

There appears to be a growing demand for fireplaces which can be converted easily from coal to electric fires either of the inset or imitation coal types. Such surrounds are to be found among a distinctive display of the latest Bratt Colbran designs. Electric clocks, too, are incorporated in the combined coal and electric fireplaces produced by the Bell Fireplace Co. and Cakebread Robey & Co., Ltd. Among a number of inset fires shown by Builders' Merchants (London), Ltd., is a new Graham Farish model with some novel features which have still further simplified fixing.

Health appliances are represented by Ideal Home Electrical Appliances, Ltd., and aids for the deaf are to be found on the stands of Fortiphone, Ltd., and R. H. Dent, Ltd.

As usual, the exhibit of the General Post Office is of outstanding popularity. This year the central feature is devoted to the various Post Office communication services with other countries, and special arrangements have been made so that visitors may speak to telephone officials in various part of Europe and the British Empire. One of the master valves and a huge insulator of the Rugby wireless station are on show, and a sailor from H.M. Telegraph Ship *Monarch* explains the laying and maintenance of submarine cables.

Air mail, teleprinters, the "Speaking Clock" and examples of apparatus used by the Post Office Research Station at Dollis Hill for testing and experimenting are other attractions, while special features are a full-size underground cable chamber and one of the P.O. tube trains which run at a speed of 35 m.p.h. without drivers or guards to carry mail bags through 6½ miles of tunnel between the main London stations and the chief postal sorting offices.

Television has a separate section of its own. In a replica of a studio at Alexandra Palace can be seen apparatus and artists under actual working conditions, the artists in their special "make-up." Some of the most spectacular pieces of apparatus used in the control room and radio transmitter are also shown, a series of mural photographs telling the whole story of a television scene from the studio to the aerial. Rows of Marconiphone receivers round the walls permit visitors to see the B.B.C.'s regular transmissions, and during intervals a film is presented describing the building of the Alexandra Palace equipment and some aspects of its operation.

All the lighting effects for the "special features" of the Exhibition were carried out by A. O. Gibbons, Ltd., whose patent "16" fittings (incorporating transformers operating 12-V lamps) are used largely for illuminating the friezes in the main hall.

A Diesel-electric Driven Pilot Cutter

THE Trinity House pilot cutter *Vigia* which was recently completed by Fellows & Co., of Great Yarmouth, has a comparatively small engine room but a considerable amount of convenient accommodation has been obtained, largely as a result of installing high-speed Diesel engines of similar type to those now in use in this country for commercial vehicle operation. The three engines in the *Vigia* are of the A.E.C. compression-ignition type, each rated 100 h.p. at 1,650 r.p.m. The whole of the electrical propulsion equipment, the auxiliary electrical machinery, and the switchgear are of British Thomson-Houston manufacture.

The main generating sets and the geared propulsion motor are situated amidships. The A.E.C. Diesel engines are of the six-cylinder type, and each engine is direct coupled to a 66-kW 250-V d.c. shunt-wound generator. The propulsion motor is continuously rated at 50/240 s.h.p. at 500/1,050 r.p.m., and the speed is reduced to 125 r.p.m. by means of double helical reduction gears. A Michell thrust block is embodied in the gear case.

The switchboard comprises three 66-kW 250-V generator panels; one 240-h.p. propulsion motor panel with engine-room control gear; one auxiliary motor panel equipped with starters for a 3-h.p. circulating pump motor and a 12-h.p. windlass motor, both of B.T.H. manufacture; and a battery-lighting control panel. The equipment includes a bridge controller, also a dimmer-controlled illuminated propeller tachometer and direction indicator. The series speed and field control is carried out normally by means of solenoid-actuated contactors operated through the master controller, which is mechanically driven by the bridge telegraph.

As an emergency standby method of engine-room control a cut-out switch is provided on the switchboard, by means of which all contactor and relay solenoids can be isolated, and a simple hand-operated and mechanically interlocked system of control switches manipulated as called for on the telegraph.

The bridge controller can be moved from full ahead to full astern, or *vice versa*, as rapidly as the operator cares to move the handle, without even the slightest pause.

With one engine alone (80 per cent. of rated output) a speed of 6.27 knots is obtained.

The main generators are shunt wound in order to simplify the switchgear as much as possible, but if closer voltage regulation were required, as would be the case if lights were supplied from the power circuit, level compound generators could be used. The propeller motor field booster, which is a B.T.H.-patented feature of this scheme, provides a high degree of stability and the inherent characteristics of the field booster limit the peak loads during propeller acceleration and reversal to a value safe for one, two or three engines, depending on the number in service at the time. The protective properties of the field booster are equally effective with either the bridge or emergency engine-room control system in service. Should any generator circuit-breaker open, means are provided automatically to reduce the propelling load to a value within the normal capacity of either the one or two generators still left in service.

The vessel can be operated at full power in less than two minutes after starting from cold, and thus standby operating charges are considerably reduced compared with a steam-driven vessel. Regarding freedom from noise and vibration, this vessel is claimed to be superior to any of the Diesel-electric tugs put into service in English waters during the last four years.

Electrical Books in Public Libraries

Several public libraries issue lists of books on their shelves which relate to specific subjects. The Mitcham Library publishes one on electrical engineering, which under various headings gives the names and authors of books in its stock. This list does not include works on electrical communications or traction. While the books are lent only to readers resident or employed within the borough, the list is likely to be useful to others, as the works mentioned are well chosen and representative. Copies can be obtained from Mr. K. G. Hunt, Borough Librarian, London Road, Mitcham, Surrey. A stamped addressed envelope should be sent. Almost any book or periodical not included in the list can be obtained for those eligible as readers through the agency of the South-Eastern Regional Library Bureau or the National Central Library.

Local Storage Heating. By W. L. Shand, M.I.E.E.

Making the most of the advantages of electricity

DURING the last few years an increasing amount of attention has been paid to heating problems by architects and their clients who finance building developments, yet even now when an extensive heating system, including the provision of hot water, is required, the only alternative usually put forward to the use of fires and chimneys is an arrangement of steam or hot-water pipes and radiators supplied from a central boiler. This is a clumsy arrangement, for not only does the boiler plant require space, flues, maintenance and attention, but the heat is generated where it is not wanted and conveyed by pipes through parts of the building where it is not wanted either.

Local heating is the ideal to be aimed at, because with proper control every change of outside temperature can be countered immediately on the spot. The source of heat is turned into heat only where and when it is wanted. Coal gas and electric fires meet this condition, but have disadvantages which more than neutralise their efficiency in this respect.

Electricity is now offered at specially low rates to replace coke, gas and oil in the heating of the central boilers, but this method does not make the most of an essential distinction between electricity and other heating agents. Electricity regarded as a source of heat is a high-grade fuel approaching 100 per cent. in efficiency, but it represents only 25 per cent. of the heat contained in the fuel used to generate it. Even though a low-grade, cheap fuel can be burned in a power station, on the basis of heat units coke put into the central heating boiler is cheaper.

A Far Better Way

In spite of this, however, electrically heated boiler installations are to be found in successful operation all over the country, and this is surely a hopeful augury. There is, however, another and far better way of using electricity as a high-grade fuel for heating than by degrading it to the level of coke by turning it back into hot water or steam whence it was originally derived. This is by local thermal storage. For space heating hardly any attempt has been made to develop this principle, although local storage water heaters have already proved economical and storage heaters embodying soapstone, iron, water and diphenyl have been on the market for some years, but the demand for these has not been encouraging. There is no doubt, however, that a system of local heat storage could be applied not only to large buildings, blocks of offices and residential flats, but also to the groups of houses of quite moderate size which are now being built all over the country. These would take a very considerable amount of electricity from the mains that could be furnished profitably at little more than works costs.

A simple method that has already been proved abroad is one in which each room or passage in a block of flats has one or more non-luminous tubular or other storage heaters, arranged as wall or ceiling panels or placed on the floor. Such heaters are connected to a special circuit run from the supply mains. Current is cut off for periods ranging from twelve to three hours a day or else the voltage fluctuates as on the change-circuit system, but the characteristics of the individual heaters are such that heat continues to be emitted while the current is off. This heat emission is controlled on the spot either by thermostat or by hand.

Heating Blocks of Flats

In the case of a new block of flats the architects and builders are relieved of the trouble and expense of providing a central boiler-house and a honeycomb of piping, taking up space and radiating heat where it is not required, while the users pay for just the amount of heat they want. The amount of building space so saved is estimated at from 5 to 10 per cent., while owing to the ease with which electric wires can be run the heaters can be placed where they are most wanted and fit in best with the design, decoration and furnishing of the rooms.

The advantages with old blocks of flats and offices are even greater, because it is far easier and cheaper to run a system of electric wires than to find room for a boiler house and to cut away walls, floors and ceilings for water or steam pipes.

Coming to groups of houses, the advantages are still more striking, as an ordinary system of central heating in a house of moderate size is a costly luxury, and when serving a number of houses it involves long lengths of piping which waste heat however efficiently they are lagged. With the local electric storage system the pipes are replaced by wires with great saving in first cost and in losses, and all the benefits of central heating are extended to an ordinary £1,000 house.

A Paris installation which has stood a winter test provides a practical example on a substantial scale of the principles here discussed. In a block of flats built in 1931 electric heating has been in normal service since the winter of 1933-34 when almost the whole of the apartments have been let. The cubic contents of the block are about 490,000 cu. ft., of which 420,000 cu. ft. is heated.

The heating load of 500-kW installed in this block of flats (including water heaters) is supplied during the night at 15 centimes per kWh. The cost of heating the apartments is entirely at the charge of the proprietor. The rents include a charge for the maintenance of a temperature of 64.5 deg. F. in all the principal rooms and 61 deg. F. in the passages and service rooms, from November 1st to April 1st.

The apparatus used is of the dry thermal storage type for which electricity is available only from 6 p.m. to 7 a.m. and from 11 a.m. to 2 p.m. Regulation is by means of a clock controlled by a group of five thermostats placed on the exterior of the building. The duration of the load is a function of the external temperature, and in the winter 1934-35 never exceeded eleven hours on the coldest days (when the mean external temperature was 27 deg. F.). As the off-peak rate is allowed in Paris for sixteen hours out of twenty-four, there is a margin of five hours, which would permit the temperature to be maintained at 64.5 deg. F. with an exterior temperature of 10 deg. F.

During the 191 days of heating in the winter the 220 storage heaters consumed 350,000 kWh of the 454,000 kWh supplied for space and water heating. For the other uses of electricity, such as lighting, the annual consumption was 42,000 kWh paid for at 30 per cent. less than the normal low-voltage supply. The consumption in the large studios on the seventh floor and the servants' quarters on the eighth is heavy, for no provision has been made for heat insulation of the walls.

The heating circuit is supplied through the proprietor's meter, and a second circuit supplies energy for other purposes through two meters (light and power) in each flat. Each tenant can thus augment the heating of his flat at any time. The cost of distribution and upkeep is said to be negligible.

Other Examples

Another example is supplied by a day school equipped with thermostatically controlled tubular heaters, heat storage being provided only by the walls and furniture. Domestic hot water is obtained from one 20-gal. and three 1½-gal. storage heaters. Temperatures are maintained for 180 days in the year at 60 deg. F. in classrooms, 54 deg. in the corridors and 45 deg. in storerooms. The total space heated is 170,000 cu. ft. The consumption is 95,000 kWh (including water heating) and the annual bill at 0.33d. per kWh for all purposes, including lighting and cooking, is £145. Capital expenditure on electrical heating equipment amounted to £910.

In a further case in a London bank some 49,500 cu. ft. is warmed to a temperature ranging from 68 to 62 deg. F. by means of 35-kW of soapstone local heaters. These cost £135 and consumed 18,630 kWh during two winter quarters. The cost of electricity was about £30 for the period.

Cost Comparisons

The accompanying table draws a comparison between the costs in round figures of heating a block of seventy residential flats (253 rooms) with a content of 855,000 cu. ft. by means of a central electrically heated boiler, and by means of local storage heaters in conjunction with water heaters :—

CAPITAL COST.	Central heating. (Actual).	Local heating. (Estimated).
Builders' work :—		
Transformer sub-station	£300	£300
Boiler house and stack	£650	—
Provision for piping	£300	—
Heating work :—		
Electric boilers, storage, tanks and other boiler house equipment	£1,200	—
Calorifier	£610	—
Piping for panel heating and domestic hot water	£3,400	—
300 local storage space heaters (640 kW) including thermostats	—	£2,200
80 local storage water-heaters (4,000 gal.)	—	£2,000
Wiring and switchgear	£80	£1,000
Total	£6,540	£5,500
Capital saving on local storage		£1,040
ANNUAL RUNNING COST.		
Electricity for space heating (kWh)	1,165,000	932,000
Electricity for domestic hot water (kWh)	365,000	365,000
Total	1,530,000 (actual)	1,297,000 (estimated)
At 0.225d. per kWh	£1,440	£1,212
Annual saving in cost of electricity (estimated)	—	£228
Saving in labour and maintenance, say	—	£162
		£390
Interest, etc., on capital saving of £1,040, say	—	£75
Total annual saving		£465

It has been stated that to compete with coke electricity must be sold at 0.1d. per kWh, but this would be true only if the basis were simply heat units extracted from the fuel without regard to the efficiency with which the heat is applied for the purpose for which and at the place where it is required.

The heat efficiency of electricity at the point of application and where it is paid for is 100 per cent., whereas that of coke is less than 50 per cent. at the same point, having regard to losses in boilers, flues and piping, and it is paid for at the coal cellar. Apart from considerations of labour saving, cleanliness and convenience, electricity at 0.2d. per kWh in a central heating system can, therefore, hold its own with coke on heat units usefully employed alone. Taking into account the saving in labour costs of handling fuel and ashes, a price of 0.25d. per kWh may be taken as the equivalent of coke even for large buildings. Oil is more expensive, and although it is easily controlled, there are maintenance costs which are not incurred with electricity, so that the equivalent price which could be paid per kWh is probably about 0.33d. in this case.

Further economies due to the facility and cheapness with which electricity, and electricity alone, can be used where and when it is wanted enable the consumer either to pay a higher price per kWh or to make an annual saving.

It has been found that with local heating locally controlled there is a saving in heat units used of about 20 to 25 per cent. over a central boiler system. This is due not only to the absence of heat losses in the boiler and pipework, but also to the greater flexibility of control whereby temperatures are not allowed to exceed those which are comfortable, while unoccupied rooms are maintained at a temperature just sufficient to keep them dry. This ease of control reduces waste even where the user is not charged according to the heat he uses. Where he is, he will obtain further economies by exercising care.

The conclusion is that if electricity can economically be used at 0.25d. per kWh for the central heating system, it can stand a charge of 0.33d. in the local storage system, in addition to the advantages of suiting the position and design of the radiators to their surroundings.

One of the chief obstacles to the adoption of electricity for heating is the reluctance of architects and their clients to depart from standard practice, by which is meant central heating by coal, coke or oil as the annual cost of heating a building and supplying hot water can be predicted fairly closely from past experience. In America and in some other countries public utility undertakings will contract to sell heat, *i.e.*, to keep the house or other premises at a certain temperature throughout the year. They strike an average and quote a price based on cubical contents after having satisfied themselves that the outer walls are reasonably insulated to reduce heat transference.

Empire Broadcasting

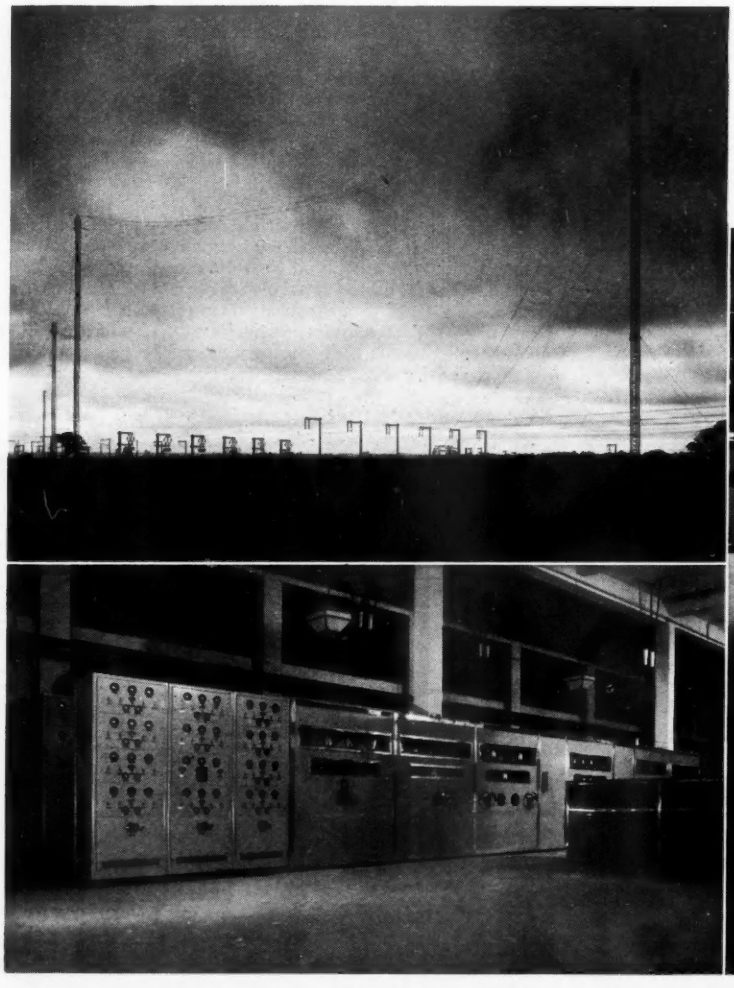
SOME details of the short-wave radio transmitting plant at Daventry, which provides the Empire broadcasting service, were outlined on Tuesday of this week by Sir Noel Ashbridge, Controller of the Engineering Division of the B.B.C.

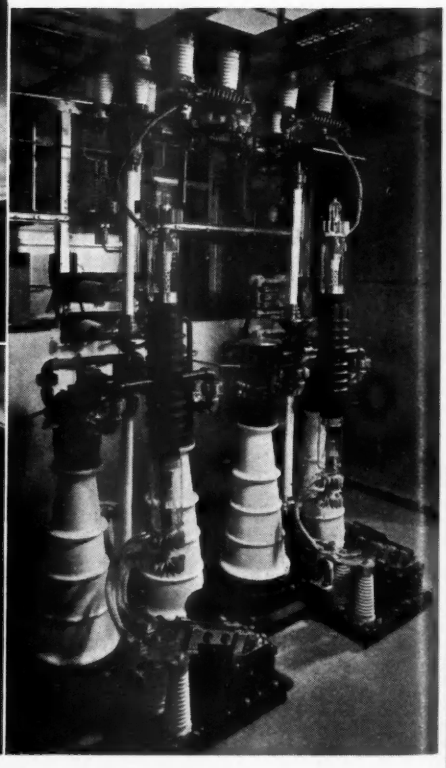
Three new additional transmitters had been provided, one made by Marconi's Wireless Telegraph Co., Ltd., and two by Standard Telephones & Cables, Ltd., generally similar to the short-wave telephony equipment installed at the P.O. station at Rugby. They were now being tested and at least two of the new transmitters would be in operation in time for the Coronation. The new transmitters would be of 50 kW and when the station was completed six transmitters would be available.

Two Diesel-engine generating sets had been installed as stand-by to the power purchased from the public mains, of the order of 1,000 kW, according to the adjustment of the transmitters, one of which utilised a "floating" carrier wave.

The new station would be transferred to the channels (fifteen wavelengths) employed by the old plant. More land had been purchased for site enlargement to accommodate the reorganised aerial system. Nine additional masts had been erected and an array of twenty-three aerial systems was now available for transmission in twelve directions. The two extreme masts were three-quarters of a mile apart.

Each aerial had been fitted with a reflector for concentrating and directing the radiation and also to minimise echo, which was liable to cause resonant reception. The aerials were served by six miles of feeder wires, supported on 500 poles. An elaborate aerial "exchange" had been provided to enable any transmitter to be switched on to any aerial.





The Empire Station, Daventry:—Top left: The Australian, Indian and West Indian transmitters. Bottom left: One of the 50-kW transmitters. Right: Final stage of the modulator unit

Meetings and Discussions

The prepayment meter has proved most valuable in encouraging the use of electricity by small consumers, and many ingenious mechanisms have been devised. Various aspects of these meters are considered in a paper by Messrs. J. Prince and M. Whitehead, read before the I.E.E. last week. Another interesting I.E.E. paper was that dealing with the recording of heart action by Dr. D. Robertson yesterday (Thursday). When the Faraday Lecture was delivered in Dublin Mr. Sean O'Kelly mentioned the progressive policy which had been pursued in the equipping of Irish hospitals with the latest electrical appliances.

Coin Meter Mechanisms

THE general principles underlying coin-actuated mechanisms, with particular reference to electricity meters, are analysed in the paper by Messrs. J. Prince and M. Whitehead (Ferranti, Ltd.) which was read before the Meter and Instrument Section of the Institution of Electrical Engineers in London on April 2nd.

The functions which the coin-freed device is required to perform are described, while the influence of various forms of tariff on meter design is discussed and different types of single- and multi-coin mechanisms are outlined. Incidentally, it is pointed out that "prepayment mechanisms" is no longer an appropriate term, because the introduction of fixed-charge collectors makes it possible to arrange for post- as well as prepayment.

The authors state that the prepayment meter is the best means of promoting the use of electricity among people of small means. The payment may be made in small amounts, which is of great importance to such people and may be the deciding factor for or against their use of electricity. Broadly, the consumer can pay when convenient, since the amount allocated to electricity can be inserted in the meter on receipt of the weekly wage. Also the consumer cannot unknowingly run into debt, except in the case of fixed-charge meters. Since coins have periodically to be inserted in the meter it is more frequently brought to mind and provides an incentive to check running cost.

Disadvantages to the consumer are that he pays more per kWh and his supply is interrupted without adequate warning. Advantages to the supply authority are that accounting cost is less; bills do not have to be sent out, and bad debts are reduced, but the costs of meter reading and money collection are increased, while more maintenance is necessary. Other advantages accrue from special applications, in hotels, &c.

The most serious fraud is the insertion of an implement to stop the meter, while the use of tokens made of ice leaves little trace after operating the mechanism.

The testing of prepayment meters as outlined by the authors is fairly simple in character and does not demand very special or costly apparatus. The importance of automatically testing coins varies with the application of the mechanism. In vending machines it is of great importance, while in electricity meters it is of somewhat less importance. Diameter is the most suitable property of coins, either for testing for correct coin or discrimination between coins. In electricity meters tariffs affect mechanism design through the demand for greater flexibility to meet frequent changes in magnitude and type of tariff, *e.g.*, price per kWh and fixed charge.

Excluding the actual automatic tests on the coin and the switch performance, the important features are consistent and accurate kWh per coin, and effect on meter accuracy. In this respect the ideal state of affairs would be for the spring provided to assist the gearing to be effective at all times (including tripping) up to the train, in addition to some device to prevent transition-wheel effect. The meter would then do no more work than a meter without mechanism, and the accuracy of kWh per coin would be much improved. Experience has shown that in practice either one is capable of considerable improvement at the expense of the other.

One important point which reflects directly on meter design is control of the money collection. Where the technical department does not make the collection it is important for the meter to be completely inaccessible when the coin box is removed. With the object of obtaining some reliable information on this point, the practice regarding responsibility for money collection of 301 undertakings involving 3,628,751 meters (2,529,849 quarterly and 1,098,902 prepayment) was examined. Of these undertakings 58 per cent. gave the responsibility to the treasury department, 40 per cent. to the meter department, and in the remainder both departments had access. This shows no marked tendency in either direction, but what is probably of greater interest is the fact that the majority of prepayment meters are attended to by the treasury department.

In one case the lock is actually fixed before the meter is tested. It is evidently desirable for the meter to be separated from the coin mechanism and coin box, and also, from the point of view of meter accuracy, that the division should be sealed against the entry of foreign matter.

Prepayment meters are not used to any great extent outside Great Britain, one of the most important aspects being psychological reaction. For example, the authors believe that in Canada and the United States there is a definite objection to prepayment. A few are used in Holland (by the lower and part of the middle class), Austria, Switzerland, New Zealand, and Italy. In the last-named country their use is confined to isolated towns and is decreasing. They are not used in Denmark, France and Portugal. In Belgium a deposit guarantee is generally required, which eliminates the greatest advantage possessed by prepayment meters. The reason given in Spain for not using prepayment meters is their greater cost as compared with quarterly meters. In two foreign countries only can the authors find evidence of the use of two-part tariffs operated by prepayment meters. In Italy and Holland a small number are used. Similarly, tokens are sometimes used in Italy and Finland and can be purchased from shops. The manufacture of this class of meter appears to be carried out in a number of countries, notably Denmark, Holland, Austria, Germany, and Switzerland. No evidence has come to light regarding the use of optional-coin electricity meters.

The consideration of foreign practice resolves itself somewhat into giving reasons why prepayment meters are not used to any great extent. In many cases the reason is psychological, but there is also another reason. The legal requirements relating to prosecutions in a number of countries are such that a person must be caught in the act of defrauding. The difficulties of doing this are obvious, and in consequence prepayment meters are not favoured.

Recording the Action of the Heart

THE examination and recording of the human electrocardiogram by means of a cathode-ray oscillograph is discussed in the paper by Mr. D. Robertson which was read at the Institution of Electrical Engineers in London on April 8th. The author is a doctor of medicine and is closely associated with A. C. Cossor, Ltd., in the design of cathode-ray cardiographs.

Activity in all living tissue is associated with an electrical change. The active part of the tissue acquires a negative potential with respect to the inactive portion. Thus, in an outside circuit formed by the application of suitable electrodes current will tend to flow from the inactive to the active portion. For example, during the passage of a nervous impulse along a nerve that part of the nerve where the impulse is momentarily present is (during the short time it remains there) negative in potential with respect to the inactive portions of the nerve. Similarly, activity in muscle is associated

Mr. A. W. Barham, chief engineer and general manager of Watford Electricity Department, explaining the working of a boiler to Lord Derby after he had inaugurated the generating extensions on Friday last **(see page 538)**

with quite large changes of potential, up to 20 mA and more. The heart is a mass of specialised muscular tissue arranged to act as a pump. Its rhythmic activity corresponds with a regularly recurring wave of potential difference between any two points on the surface of the heart.

The wave-form is complex; its period is very long, corresponding to the pulse rate, which is variable. Most of the p.d. between two areas of the heart's surface will disappear by reason of the good conductivity of the tissues surrounding the heart (especially the pericardial fluid), but there is quite usually a p.d. of more than one mV for the short time when it is the maximum (the largest peak on normal cardiograms).

Standard connections are between the patient's (1) right and left arms, for voltages appearing across the base of the heart; (2) right arm and left leg, for voltages between the base and apex of the heart; since the latter is tilted, this connection provides a composite "picture"; and (3) left arm and left leg, for events occurring chiefly in the left ventricle. More recently a fourth connection has been made between the chest at the apex of the heart and the patient's back at the angle of the left scapula, for potentials in an antero-posterior plane; but this does not reveal much additional information, except in certain cases of coronary infraction.

The original indicating instrument was an Einthoven string galvanometer, later of the mirror type and embodying a valve amplifier. The cathode-ray oscillograph is free from inertia and is, according to the author, peculiarly suitable for everyday electro-cardiography. It can be made portable and the use of a fluorescent screen of very long afterglow provides a new facility for direct examination at the patient's bedside.

The author discusses the "patient circuit," briefly considering the nature of the "signal" which the recording apparatus is required to depict and examining incidental electrical phenomena present in the patient himself that may affect it. Each complete waveform is a record of the electrical events accompanying each heart beat and, at the common pulse rate of 72 per minute, occupies a time of approximately 0.8 second. Contrary to usual electrical convention, and because biological activity is accompanied by a negative electrical change, movements above the iso-electric baseline (of a string cardiograph) are negative and those below are positive. A normal cardiogram has five peaks; the first, third (maximum) and fifth upward and the second and fourth downgoing. There is no sure knowledge of their significance; all that is known at present is that the first peak corresponds to the contractions of the auricles (small collecting chambers) and the other peaks represent electrical events accompanying contraction of the ventricles (large pumping chambers).

The design of valve amplifiers for electro-cardiographs employing any indirect recording system is of extreme importance (to avoid distortion) and is discussed in some detail by the author, who regards the cardiogram as a complex wave-form of the nature of a random transient of the Heaviside type, but finite in duration. The author's endeavour is to prove that apparatus as designed by him does in fact provide a distortionless picture of the electro-cardiogram as presented by the particular individual whose heart is under examination.

The cathode-ray tube used is of the low-voltage (700 V anode) gas-focused type with a Cossor-G zinc sulphide fluorescent screen. The presence of a "phosphorogen" provides an extremely long decay period, the actinic value of the afterglow being small, so that special colour screens are not needed to obviate fogging when the record is being photographed.

To render the outfit portable so that it can be used anywhere, in a hospital or a country cottage, it has been necessary to make the input supply to the instrument adaptable to all circumstances. As an alternative to direct a.c. mains operation the instrument may be energised by a small rotary convertor, driven from a 12 V motor-car battery or from d.c. mains through a variable resistance. Precautions for minimising high-frequency interference are discussed, and a balanced amplifier is now being evolved for eliminating spurious voltages.

Beside visual observation photographic records are obtainable by means of an integral camera using special Ilford paper of standard cinema width (35 m.m.) and driven by clockwork with change-speed mechanism and an independent time marker.

Electricity in Irish Hospitals.—The importance of electricity to the Free State Government in its ambition to make Irish hospitals as well equipped as any others in the world was stressed by Mr. Sean T. O'Kelly, Minister for Local Government and Public Health, presiding, when the Faraday Lecture of the Institution of Electrical Engineers was delivered in Dublin by Mr. Robert S. Whipple, the subject being "Electricity in the Hospital." All over the country, Mr. O'Kelly said, they were building hospitals and improving old ones. One of Europe's few modern all-electric hospitals was the National Maternity Hospital, Holles Street, Dublin. Those who had designed and equipped it had made wonderful use of electrical science in its application to gynæcology. He believed that the medical and surgical advances of the last forty or fifty years probably could not have been made without the electrical engineer's assistance. Every modern operating theatre used electricity. Irish men of science, without the opportunities of their colleagues in some bigger countries, were doing good work, and members of the Institution of Electrical Engineers there, Mr. O'Kelly added, were giving wonderful help to surgeons and hospitals.

A Hotel Installation

A GOOD example of the effective use of a combination of different coloured neon tubes for cornice lighting is to be seen in the cocktail lounge, as well as the entrance lobby and corridors, of the new Winston Hotel, Piccadilly, London. Novelties in the way of special lighting fittings to assist in producing a Continental atmosphere have been introduced in several of the main rooms.

In addition to installing the air-conditioning system for the whole building, York Shipley, Ltd., have supplied ice-making plant, refrigerators, a cold room and beer coolers.

The kitchens are exceptionally well equipped with electrical appliances, the Jackson cooking apparatus installed comprising four large baking ovens, grillers, a steaming oven, boilers and hot-cupboards. Altogether the kitchen load totals 220 kVA and this is controlled from the main kitchen by a central iron-clad switch panel (embodying "Glasgow Rex" switch fuses), upon the neat lay-out of which the electrical contractors, L. & J. Smith, are to be congratulated. The central heating furnaces are electrically fed and controlled by thermostats in the boiler rooms and public rooms.

Four electric lifts have been installed by Penrose Lifts Co., Ltd., and a "Telematic" automatic telephone system is provided. Some of the suites of rooms have their own small kitchens, each provided with a Jackson cooker and a "Kelvinator" refrigerator. Built-in loud speakers have been installed by Radio Furniture & Fittings, Ltd. The electrical points throughout the building number about two thousand, and are fed from a rising main of paper-insulated four-core armoured cable in connection with which there are phase-changing link boxes on each floor.

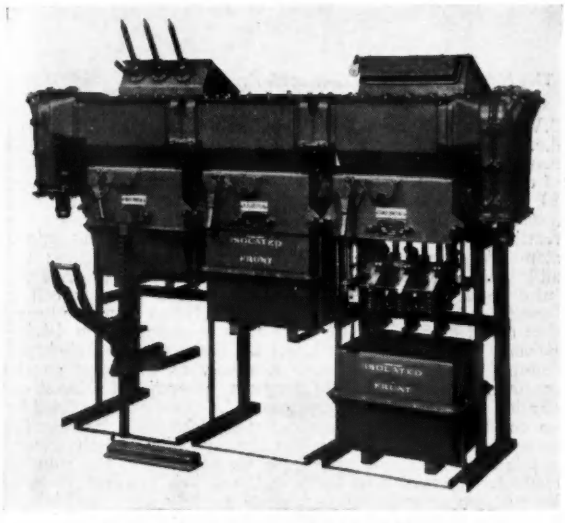
The cocktail lounge and the kitchen at the Winston Hotel, Piccadilly, London [*Elec. Rev. photos.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Ring-main Switchgear

A new design of iron-clad oil-immersed compound-filled switchgear has been introduced by Switchgear & Equipment, Ltd., 90-96, Cannon Street, London, E.C.4. It is intended for use on ring mains, but the incoming lines, instead of being



Oil-immersed compound-filled switchgear

controlled by oil-immersed load-break isolators, are connected direct to the bus-bars at opposite ends. The ring can be broken in the middle by an automatic bus-section switch, which enables the local load to be supplied from either half of the bus-bars through the two other automatic circuit-breakers making up the unit.

When the tank is lowered to the position shown in the centre of the accompany illustration it is completely isolated from the bus-bars, and no live parts are exposed. The tank on the right-hand side of the switchboard is lowered to the ground and the spouts covering the sockets of the isolation plugs are automatically and completely shrouded; in this position the circuit-breaker can be opened and closed by hand for lining up contacts. Access to the cable-testing sockets, which are shown directly over the cable-sealing chambers, is obtained by removing the padlocked weatherproof cover. On inserting the test plugs, the cable end is first earthed, and before this earth can be taken off the test plug must be turned through an angle of roughly 90 deg. The plug can then be pushed fully home, thus isolating the cable end and the leads attached to the terminal of the test plugs. A trifurcating box is fixed at each end of the bus-bar chamber to receive three-core cable, and each of the incoming and outgoing circuit-breakers is provided with glands for single-core cables.

The equipment is manufactured for pressures of from 3.3 to 11 kV and up to 200 A. The rated rupturing capacity is 75,000 kVA at 11 kV.

Multi-compartment Ovens

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1, is now supplying many of its industrial-type ovens mounted on one stand in banks of two or three compartments. Two standard 5.1-kW steaming ovens, for example, are obtainable mounted side by side, with illuminated-type switchgear attached at each end, the ball-valve tanks being fitted at the back of each compartment. The overall measurements are: Height, 4 ft. 10 in.; width, 5 ft.; depth, 3 ft. 2 in. Pastry ovens, too, are built in one, two or three "decks" (4.2 kW each), and independent switching enables extra decks to be added should a single one only be installed initially.

Black stove enamel is the standard finish employed for this industrial-type equipment, a *de luxe* finish also being available in light mottled grey vitreous enamel with (in some cases) white door panels.

Toasters and Coffee Percolators

Bread and sandwich toasters and coffee percolators are among the electrical equipment introduced into this country by Catering Equipment, Ltd., 7, Burlington Gardens, London, W.1. Although useful in the home the "White Cross" coffee percolators are especially suitable for restaurants and can be supplied in 1, 2, 3, 4, 6 and 8-unit models. They are finished either in plain chromium plate or chromium and black stove enamel. The 600-W radiant bar type elements are arranged to give a serving heat (80 W).

Table-top Cookers

Two new table-top electric cookers of ultra-modern design just introduced by Moffats, Ltd., Blackburn, are identical except that the "163 M" has three boiling plates and the "164 M" four. "Therm-o-matic" oven heat control is included as standard equipment, together with stainless-steel "Cookquick" boiling plates, patent balanced drop-down oven door, hob floodlight and "minute minder" beneath which is situated a condiment set.

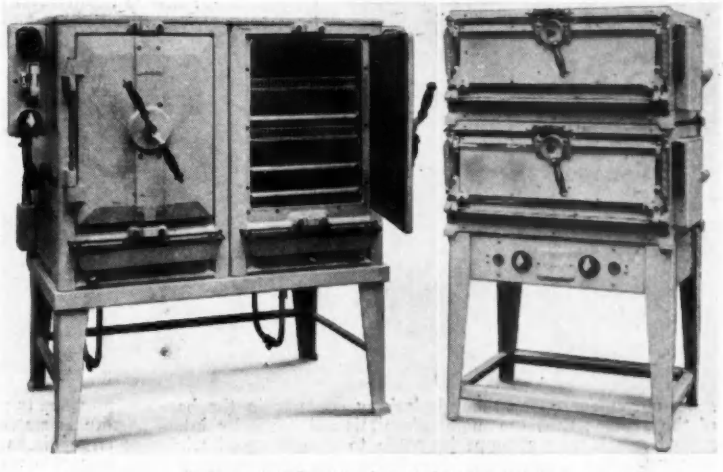
The "164 M" Moffat cooker

The arrangement of the boiling plates in one line, besides giving more working space on the hob, obviates the necessity for the users' having to lean over the front plates to reach the back ones, thus avoiding heat, steam, &c. An exceptionally large oven (16 in. wide, 19½ in. deep and 12 in. high) has an independently heated (500 W) warming drawer below, while on its left is a roomy cabinet for the storage of cooking utensils, &c. The oven elements total 3,100 W, 1,800 W at the top and 1,300 W at the bottom.

The porcelain-enamel finish is available in French grey and white, two-tone ivory, ivory and green, ivory and crimson, and ivory and jet black.

New Radio Valves

A range of broadcast radio receiver valves recently introduced by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, differs in several respects from present British design. They are expected to extend the markets to which British-made sets are exported. This new "Osram" type valve is equally applicable to a.c. and d.c.-a.c. mains sets and also to universal car radio receivers, for 6 V as well as 12 V car battery operation. The heater rating is 0.3 A at 6.3 V, thus lowering its wattage to 1.9 as compared with the more usual 4 W. The characteristics are described as "medium slope" and the new form of "octal" base (the international standard) has been adopted. Solid contacts of smaller dimensions are employed. The metal top cap (when fitted) is also smaller, while the size of the cathode has been reduced, so that the overall dimensions of the new valves have been reduced substantially.



Jackson double steaming and pastry ovens

D

An Industrial Soldering Iron

A 125-W industrial type soldering iron with angle pencil bit has been introduced recently by W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.E.1. The pencil bit is the same as that fitted to the 65-W model, except that it protrudes from the bit holder at an angle.

The iron is designed to meet the requirements of the radio industry for rapid quantity production soldering work, where the 65-W model does not provide the necessary reserve of heat. The bit holder and angle pencil bit are interchangeable with the standard oval bit, the bit itself being easily renewed without dismantling the iron. Removal is by loosening the small stainless steel grub screw in the bit holder. The copper bits of the 125-W and 240-W irons and the new bit holder are treated with a special corrosion-preventing finish and the pencil bits are tinned ready for use. The use of acid flux, however, must be avoided as this will very quickly have a deleterious effect on the iron. The heating element is totally enclosed in the bit holder, four minutes being required before the iron is ready for continuous use.

Each iron is fitted with six feet of t.r.s. 3-core flexible with ends trimmed to take a 3-pin plug. A rubber sleeve cord grip holds the sheath of the flexible and prevents sharp bending where the flexible leaves the handle, and also prevents any twisting or pull being transmitted to the internal wiring. All connections are made in a bakelite connection box at the end of the handle.

A.c. Change-pole Switches

There has recently been put forward by the British Thomson-Houston Co., Ltd., Rugby, air-break drum type change-pole switches intended for changing the speed of two-phase and three-phase change-pole squirrel-cage induction motors where the stator current does not exceed 30 A at voltages up to 550. These switching devices, when used with appropriate motors and starters, are particularly suitable for use in machine tool driving.

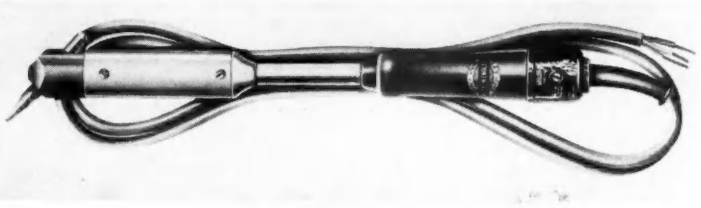
B.T.H. a.c. change-pole switch

A maximum of four speeds can be obtained when the switch is used for varying the stator tappings of not more than four separate windings, and the device is invariably employed in conjunction with a separate circuit-breaker, contactor, or other starter for the motor. To ensure that the circuit is neither made nor broken on the change-pole switch contacts, but always on the starter or breaker contacts, the change-pole switch is electrically interlocked with the starting device. The switch is operated by a lever engaging in notches at the "off" and each running position. Depressing the lever disengages it from the notch, leaving it free to be moved to any position, and the same movement opens the interlocking contacts in the base of the switch; thus the motor circuit is automatically interrupted should any attempt be made to change speed while running.

In addition to machine tools, the switch is used for pumps where from two to four different speeds are required. No power is dissipated uselessly in resistances, the power output being at all times comparable to the current taken from the line.

A D.c. "Transformer"

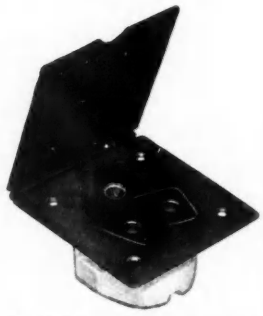
What is described as the Elsome-Jones d.c. "transformer" was demonstrated last week at the offices of Technical Inventions, Ltd., Terminal House, Grosvenor Gardens, London, S.W.1. It is intended for the lighting of neon lettering from d.c. mains without the aid of a convertor, and for energising neon signs on moving vehicles. In the latter case the source of energy would be the car-starter battery, an input of 4 A at 12 V, providing an output of the order of 7 mA at up to 6,000 V. The device is of small dimensions, and consists of a relatively high-frequency rotary interruptor injecting into a step-up transformer of normal design, but performing the additional function of furnishing the flux needed to drive the interruptor. Part of the core limb of the primary coil is brought out to form two pole pieces. Between them is a heavy disc rotor, of special cam shape to require very little driving power. By loosening a lock nut the position of a single-brush commutator can be adjusted relatively to the rotor on the common spindle for timing purposes, otherwise the input excitation may be appreciably increased. Starting is assisted by an auxiliary coil, which magnetically jerks the rotor into the correct pole position when the three-position switch (centre off) is sharply moved over from the starting to the running contact. A small pilot lamp in the switch housing glows so long as the rotor is running, while a safety spark gap is provided across the secondary output terminals. The initial peak voltage is high, falling quickly after striking the neon discharge. The primary coils can be suitably dimensioned for any d.c. input and the frequency is predetermined by rotor design. The output wave form is claimed to be perceptibly (by cathode-ray oscillograph) sine-shaped and the efficiency is said to be relatively high for a combination of this sort.



The Henley "Solon" 125-W soldering iron

Dust-proof Socket Covers

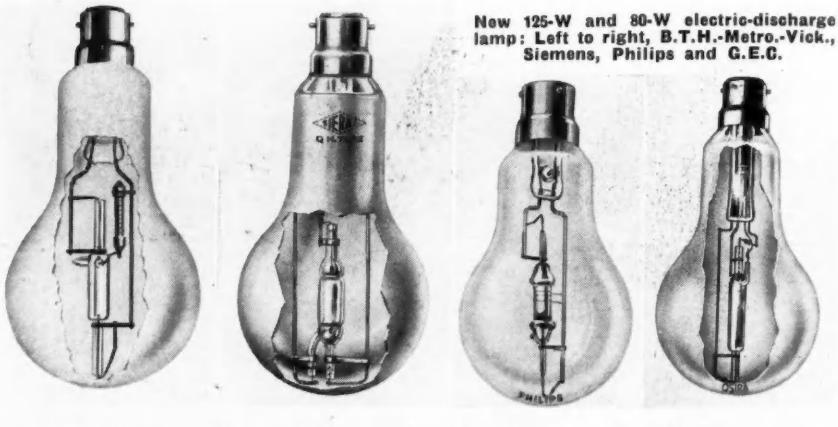
For certain positions where a dustproof cover is required for switch-sockets, M.K. Electric, Ltd., Wakefield Street, Edmonton, London, N.18, has introduced new dustproof sockets with hinged flanges in 2-, 5-, and 15-A sizes with open or anti-flash sockets. An example of this is illustrated on the above.



M.K. hinged flange socket

Low-wattage Electric-discharge Lamps

Last week the new mercury-vapour electric-discharge lamps rated at 80 W and 125 W for 200-260 V a.c. for street and industrial lighting only became available. They have an initial light output of 3,040 lumens and 5,000 lumens, respectively. The bulbs, which are internally frosted, measure about the same as those of standard 150-W and 200-W gasfilled lamps. All the lamps are designed for operation with chokes and, if desired, condensers to improve the power factor. The general characteristics at 230 V, which may vary slightly with different types according to make, are as follows:—80-W size, without condenser: Starting current, 1.2 A; operating current, 0.8 A; power factor, 0.5. With condenser, starting current, 0.6 A; running current, 0.5 A; power factor, 0.9. The corresponding figures for the 125-W size are, without condenser, 1.7 A, 1.1 A, and 0.5, and with condenser, 1.0 A, 0.6 A, 0.9.



New 125-W and 80-W electric-discharge lamp: Left to right, B.T.H.-Metro.-Vick., Siemens, Philips and G.E.C.

Three-pin bayonet caps are provided to prevent connection without a choke and the average life is stated to be about 1,500 hours. Compared with the large discharge lamps the time taken to reach full luminous output is very much less.

For street lighting, special lanterns have been introduced by the five manufacturers concerned, namely, British Thomson-Houston Co., Ltd., General Electric Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., Philips Lamps, Ltd., and Siemens Electric Lamps & Supplies, Ltd.

Conditions in the United States

Improvement in many directions

THE view that the United States is on the verge of regaining this year all the real economic prosperity attained in 1929, is expressed by Mr. H. O. Chalkley, C.M.G., C.B.E., Commercial Counsellor to H.M. Embassy at Washington, in his report on the economic and commercial conditions in the United States of America (Stationery Office, 3s. net).

This view is, however, qualified by the persistence in some directions of unfavourable conditions of employment and in the realm of public finance, where a series of budgetary deficits and increased public indebtedness incurred for emergency expenditure on recovery and relief reflect the persistence of unemployment and merge into that problem.

The restoration of foreign trade still lags far behind the improvement in domestic trade. Industry, which is not dependent upon foreign trade, is in a more secure position than agriculture. The loss of export markets has not created any industrial distressed areas, such as are to be found in the United Kingdom, but it is beginning to be realised that the ravages of soil erosion may create agricultural distressed areas. With these qualifications, Mr. Chalkley considers that the part of the "New Deal" which was directed to the relief of distress and to national economic recovery has been successful.

The available statistics of wholesale and retail trade in 1935 and 1936 confirm that improvement of domestic trade has more than kept pace with that of other economic activities in the United States. Increased sales in 1936, in some instances the best in almost a decade, have been particularly in evidence in many classes of goods. Household appliances accounted for a record volume of sales, and included electric refrigerators, vacuum cleaners, grills, irons, toasters and percolators.

The Export Trade

Following the four years of depression from 1929 the exports of fully manufactured goods again increased and in 1936 there was an all round improvement in exports of a variety of goods including internal combustion engines, wireless receivers and valves, and household electric refrigerators. Striking increases took place in the years 1934, 1935 and 1936 (first nine months) in the exports of the various groups of machinery. Electrical machinery, with a total value of $76 million in 1935, showed an increase of 14 per cent., and at $66.7 million for the first nine months of 1936, an increase of 17 per cent.

The interests of the electrical manufacturing industry are closely related to recent important developments in the production and distribution of electricity. Capital expenditure by public utility companies, maintenance costs, and Federal Government projects were estimated to call for an expenditure of $371, $101 and $250 millions respectively during 1936. Capital expenditure by the utility companies has in most instances been for expansion, as they purchased no power plant equipment except a few steam turbines, but Federal projects have usually involved the purchase of large hydro-electric machinery.

Much distribution and electrification work, including about 35,000 miles of new lines and involving the purchase of transformers, wire, steelwork, poles, insulators, &c., has been undertaken in consequence of the operation of the Rural Electrification Act. Sales of electrical equipment in 1936 are estimated at $1,590 millions, as compared with the low record in 1933 of $789 millions and the high level in 1929 of $2,350 millions. Estimates for 1937 anticipate a 20 per cent. increase over 1935.

In electrical household appliances sales are reaching new high levels and the demand for refrigerators and electric ranges stands out, sales of the former in 1935 having an aggregate value of $260 millions and the latter $27 millions. Both, particularly the latter, showed substantial increases and a continual upward trend in 1936.

During 1935 sales of radio receiving apparatus increased in value to nearly $300 millions and the first half of 1936 showed a further gain of 29 per cent. The increasing demand for automobile radio sets is expected to result in the sale of over 1,600,000 sets in 1936. It is estimated that by January, 1936, the total number of homes with radio sets had reached 22,809,000, representing 69.4 per cent. of American homes. The percentage has since increased and the industry must in the future look to the replacement of obsolete sets rather than to sales to persons who have not previously owned sets, for the bulk of their business is in models for domestic use.

Electricity Supply Progress

The electricity supply industry was in the exceptional position among United States industries of having in 1936, a larger output, larger plant capacity, and more customers than in any other year, and although by the summer of 1936 total revenues exceeded those of November, 1929 (the previous best month in the history of the industry), the general tendency in the average price of energy during recent years has been downward and the average cost per kWh is now the lowest on record, the average charge having been reduced by 21 per cent. since 1929. By July, 1936, approximately 25,707,000 consumers were using central-station electricity, of whom 21,357,000 were domestic consumers, 3,780,000 small commercial and 509,000 large commercial consumers.

The installed capacity of generators in power plants producing electricity for public use was 36,133,000 kW. Of this capacity about 71 per cent. is in steam plants, 27 per cent. is hydro-electric and 2 per cent. is in stations operated by internal combustion engines.

The total output of electricity for public use in 1935 reached a record of 99,398 million kWh, which was exceeded in 1936, since for the year ended September 30th, 1936, the total amounted to 102,335 million kWh, an increase of 14.5 per cent. as compared with the preceding year. Abundant rainfalls in 1935 caused hydro-electric output to reach 40 per cent. of the total, as compared with the average over the 1919-34 period of 36.5 per cent. Owing to the drought of 1936, however, which seriously affected some sections of the country, the energy generated by water power fell to 35.3 per cent. of the total.

Rural Electrification

In one respect, the supply of electricity to farms, the United States is backward, and behind European countries. The total number of farms buying electricity from central stations in the United States was in October, 1936, about 875,000 or approximately 13 per cent. of the farms in the country, but that figure showed a remarkably rapid rise from 750,000 in the early part of 1935. The reason is the stimulation given to rural extensions by the enactment in April, 1935, and in May, 1936, of Federal laws setting up a permanent Rural Electrification Administration with authority to make loans from a total appropriation of $510 millions at 3 per cent., redeemable in twenty-five years, to co-operative non-profit or limited-dividend associations in rural areas not receiving central station service.

The largest Government-owned and operated project is that in the Tennessee Valley administered by the Tennessee Valley Authority. The project includes the utilisation of the nitrate plants commenced during the War at Muscle Shoals. The source of the surplus power is the dam at Muscle Shoals, but five other dams commenced since 1933 are under construction. Other large construction projects of the Federal Government which will, incidentally to other purposes, produce electric power are Boulder Dam (completed in 1936), Bonneville Dam and Grand Coulee.

Radio broadcasting is carried out over networks and run by commercial enterprises including about 600 stations any or all of which can be interconnected by wire to give programmes from a single source.

E.P.E.A. Northern Dinner

SPEAKING at the annual dinner of the Northern Division of the Electrical Power Engineers' Association held at the Midland Hotel, Manchester, on Saturday last, Mr. H. S. Cox stated that a great deal had been said about the number of cookers going into use, but not so much about the number disconnected for various reasons. They must have efficient apparatus, of low first cost and low in running costs. The E.P.E.A. desired a much closer measure of co-operation between the manufacturers of equipment and the suppliers of electrical energy. Much was heard these days about training schemes for sales engineers, for whom the E.P.E.A. had instituted a correspondence course. If these schemes were to be a complete success there must be a good article to sell and electricity within the financial means of the largest possible number of consumers. Finally, Mr. Cox referred to the increase in the cost of living figures. It would be the duty of the National Joint Board, he said, to meet that situation and to see that the chaotic conditions that prevailed on the occasion of the last rise in prices was not repeated.

Ald. E. Huntsman said that to-day employers were sensitively alive to injustices and inequalities. The National Joint Board was a pattern for other industries. Responding to the toast of "The Ladies and Guests," which was proposed by Mr. W. Fisher, Miss D. Foster Jeffery (E.A.W.), spoke of the manner in which electricity had revolutionised work in the home. Mr. A. L. Lunn also replied. Nearly 300 attended the dinner; Mr. W. F. Sands presided.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The I.M.E.A. Convention

About eighty electrical manufacturers and associations are to participate in the exhibition which will be held in the Corn Exchange, Brighton, during this year's I.M.E.A. Convention (May 31st to June 4th). The list of exhibitors reproduced below indicates that there will be a comprehensive and interesting display :—

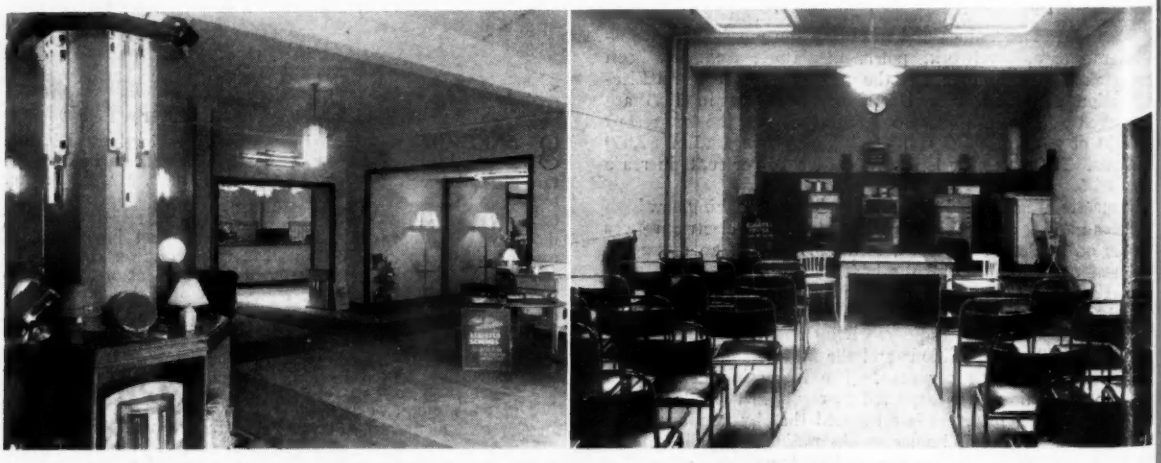
Actadis, Ltd.
Aidas Electric, Ltd.
Air Conditioning & Engineering, Ltd.
Archibald Low Electrics, Ltd.
Automatic Telephone and Elec. Co., Ltd.
Bastian and Allen, Ltd.
Belling & Co., Ltd.
Benjamin Electric, Ltd.
Berry's Electric, Ltd.
Bratt Colbran, Ltd.
Bray, George, & Co., Ltd.
Brighton Elecy. Dept.
British Electrical Development Association
British Elec. Domestic Appliances, Ltd.
British National Electrics, Ltd.
British Sangamo Co., Ltd.
British Thermostat Co., Ltd.
British Thomson-Houston Co., Ltd.
Bulpitt & Sons, Ltd.
Burco, Ltd.
Cable Makers' Association
Callender's Cable & Const. Co., Ltd.
Carron Company
Corfield-Sigg, Ltd.
Crompton Parkinson, Ltd.
Drake & Gorham Wholesale, Ltd.
Edison Swan Elec. Co., Ltd.
E.L.M.A.
Electric Vehicle Committee of Gt. Britain, Ltd.
Electrical Association for Women
Electrical Apparatus Co., Ltd.
Electrical Contractors' Assocn.
Electrical Industries Benevolent Association
Elexcel, Ltd.
Ellison Insulations, Ltd.
English Electric Co., Ltd.
Falk, Stadelmann & Co., Ltd.
Falkirk Iron Co., Ltd.
Ferranti, Ltd.
General Electric Co., Ltd.
Goodliffe Electric Supplies, Ltd.
Greene, Phillips & Co.
H.M.V. Household Appliances
Hague & McKenzie, Ltd.
Harcourts, Ltd.
Hawkins, L. G., & Co., Ltd.
Heatrae, Ltd.
Henley's, W. T., Telegraph Wks. Co., Ltd.
Holophane, Ltd.
Hoover, Ltd.
Horstmann Gear Co., Ltd.
Hotpoint Elec. Appliance Co., Ltd.
Hurley Machine Co., Ltd.
Iddon, Victor H., Ltd.
International Refrigerator Co., Ltd.
Jackson Elec. Stove Co., Ltd.
Johnson & Phillips, Ltd.
J. P. Tubular Heater Co., Ltd.
Kelvinator, Ltd.
Lightfoot Refrigeration Co., Ltd.
MacGregor & McCallum, Ltd.
Macpherson, Donald, & Co., Ltd.
Measurement, Ltd.
Metropolitan-Vickers Elecl Co., Ltd.
Moffats, Ltd.
Premier Electric Heaters, Ltd.
Pressed Steel Co., Ltd.
Radiovisor Parent, Ltd.
Revo Electric Co., Ltd.
Reyrolle, A., & Co., Ltd.
Rheostatic Co., Ltd.
Santon, Ltd.
Servis Electric Washing Machines
Siemens Elec. Lamp & Supplies, Ltd.
Simplex Electric Co., Ltd.
Stokes Appliances, Ltd.
Tricity Cookers, Ltd.
Unity Heating, Ltd.
Venner Time Switches, Ltd

New Electricity Showrooms for Chiswick

The Chiswick electricity undertaking was first taken over by the Borough of Brentford and Chiswick in 1935, and since that date much has been done to popularise the use of electricity in the district. On Friday last Mr. J. M. Kennedy (Electricity Commissioner) officially opened the first Chiswick electricity showrooms built under the new management. The Mayor of Brentford and Chiswick, Ald. R. S. Howard, in welcoming Mr. Kennedy, paid a tribute to the late Sir John Brooke. He said that the borough was indebted to the Electricity Committee and its chairman, Ald. M. Leahy, Mr. A. W. Money, the borough electrical engineer, and his staff, for the excellent showrooms. Ald. Leahy said that while they were proud of the showrooms the building was only the outward sign of the progress being made. They had recently completed a ring main scheme costing £40,000. Now that the reorganisation of the undertaking was completed they hoped to continue the progress of 1936 when the increase in consumers connected was 12 per cent. over 1935 and the sales of electricity rose by 480,000 kWh. In the autumn about three miles of Chiswick High Road were to be lighted with electric-discharge lamps and this was to be followed by similar lighting of the main secondary roads, while a new system of lighting by gas-filled lamps was to be installed for all district roads. Mr. Kennedy, in formally opening the showrooms, said that last year the average sales in Chiswick were 400 kWh per consumer (at an average price of 3½d. per kWh), and this figure could be increased to 4,000 kWh. The new showrooms consist of the converted premises of the old Chiswick fire station in Chiswick High Road. The frontage has a wide sweep of glass, with the main entrance in the centre, giving the passer-by a perfect view of the interior of the main showroom. Here many types of electrical apparatus and lighting fittings are displayed, a pillar in the centre being surrounded by electric fires of various designs. Coronation devices are also a notable feature. To the right of this room is an alcove fitted at the back with a floor-to-ceiling mirror. Behind the main showroom to the right is a counter for the payment of accounts, &c., and here also is an attractive display of lighting fittings and other apparatus. A demonstration room is capable of seating fifty people, and at the rear of the ground floor are general offices. A 150-kW Bastian and Allen boiler has been installed for heating the building. There is also a meter-testing department, which has been transferred from the electricity works and extended, while accommodation is provided for cooker reconditioning. This section is under construction and will be in use shortly. On the first and second floors are the offices and a suite of living rooms is also provided. The building is surmounted by a tower in which is an electrically illuminated clock. A lift by Hammond and Champness serves all floors. The whole of the electrical installation has been carried out by the staff, which also installed the inter-house telephone system.

E.D.A. April Programme

A 28-page Coronation booklet has been prepared by the British Electrical Development Association and in its programme for April the Association states that the booklet has a gold-embossed cover and is illustrated throughout with two colour pictures showing the part which lighting has played in past ages and how modern electric lighting will transform the cities and towns during the Coronation celebrations. Another application of the "I'm Electric" figure is the issue of stick-on seals for correspondence, &c., in blue and silver. A new wash-boiler poster with the appliance in natural colours against a blue background is available. The window display for the month is designed to link up with the national electric refrigeration campaign, while other material available in connection with the campaign includes posters and poster stamps, a booklet entitled "Electric Refrigerators Stand Supreme," and Press advertisement stereos. The programme also includes a list of 16-sheet posters.



Two views of the interior of the new Chiswick electricity showrooms, showing (left) a portion of the main showroom, and (right) the demonstration room *[Elec. Rev. photos.*

London Company's New Branch

With the opening of new premises at 101, Dean Street, London, W.1, the Wholesale Fittings Co., Ltd., now possesses five London branches. A trade counter, which has been specially designed to facilitate quick service, occupies most of the space on the ground floor, the remaining space being employed for offices. On the first floor an extensive showroom for the display of lighting fittings and general electrical appliances has leading from it two smaller rooms, one for small appliances such as irons, kettles, fans, &c., and the other for refrigerators, &c. Adjoining the further large general showroom on the next floor is a room executed in the style of a timbered barn where period fittings and wall brackets are displayed. A large stock is carried of electrical accessories, cable, tubing and lamps, including well-known proprietary lines. The telephone number is Gerrard 7222.

The new West End branch of The Wholesale Fittings Co., Ltd., at 101, Dean Street, London, W.1

Social Events

Nearly 1,000 employés and friends of the Union Cable Co., Ltd., and Southern United Telephone Cables, Ltd., attended a concert at the Winter Hall, East Ham, on Saturday, April 3rd, by the invitation of Mr. J. Snow Huddleston (managing director), who is president of the Dagenham Cables Sports Club. Many well-known members of the cable industry and their wives were present, including Col. Sir Thomas F. Purves, O.B.E., and Lady Purves, Mr. and Mrs. J. Snow Huddleston, Mr. and Mrs. Charles Pipkin, Mr. and Mrs. A. H. Selwyn, Mr. and Mrs. J. H. Roberts, and Mr. F. M. Hallett. An excellent programme was given by well-known artists. At the conclusion of the programme Col. Purves, on behalf of the large audience, expressed appreciation to the president for a pleasant evening. Mr. Huddleston suitably responded.

On Monday and Tuesday last the G.E.C. Dramatic Society gave its annual performances in aid of the Infants' Hospital, Westminster, when it presented Sir James Barrie's "The Admirable Crichton" at the Fortune Theatre. The Society appears to have an inexhaustible fund of talent, and we were very impressed by the performance of Joan Caltham (a newcomer) as the haughty Lady Mary. The many amusing situations of Barrie's delightful play were well sustained, the cast including many members of the Society who have long established themselves by past distinguished performances. As for William Avenell, we need only say that he was an admirable Crichton.

Birmingham Threatens to Buy Foreign Plant

At last Tuesday's meeting of the Birmingham City Council a resolution was passed empowering the various committees, for a period of twelve months to purchase foreign products in cases where it was considered necessary "to combat the possible effect of price rings and trusts." In the course of the discussion members of the Council alleged that the Corporation was being "milked" by combinations of manufacturers, and Alderman Sir Percival Bower, chairman of the Electric Supply Committee, complained that after expenditure upon advertising contracts identical tenders were received from manufacturers. Although companies were paying large dividends and distributing bonus shares they had the temerity to inform the Corporation that it was necessary to increase their charges by as much as 25 per cent. Sir Percival stated that in one case in which the Committee threatened to buy foreign plant, the whole of the British tenderers reduced their offer by 25 per cent. Another resolution was passed asking the Government to protect consumers against price-regulation schemes.

Callender's Dramatic

On Thursday, April 15, at 8 p.m., the Dramatic Society connected with the Callender Athletic and Social Club will present Walter Hackett's "Ambrose Applejohn's Adventure." Tickets may be obtained (from 5s. to 1s. 8d.) from the box-office manager (Mr. L. G. Baber) at Callender's Cable & Construction Co., Ltd., Hillmarton Road, Caledonian Road, N.7.

I.F.S. Electrical Imports

So far this year there has been an active tone as regards the imports of electrical machinery and cognate material into the Irish Free State. Thus, the imports during February last amounted to £76,651, as compared with £65,323 in the corresponding month of 1936. The details of the imports during the first two months of the past two years are shown in the accompanying table:—

	JAN.–FEB. 1936.	1937.
	£	£
Electric motors	10,091	8,129
Other electric machinery	26,089	34,393
Dry batteries and parts	2,011	2,267
Electric lamp bulbs	9,769	3,841
Electric lighting accessories, fittings and parts	18,484	13,009
Electric wires and cables, insulated	12,735	14,596
Telephone and telegraph apparatus	1,706	11,791
Radio receivers, complete	9,279	18,574
Radio-gramophones, complete	216	480
Other radio apparatus, fully or partly assembled	954	2,558
Radio parts and accessories	11,025	17,379
Other electrical goods and apparatus	46,854	50,960
Totals	£149,213	£177,977

As will be seen, there has been an increase in imports of £28,764. Three of the scheduled items show a decrease and nine an advance, the most notable among the latter being telegraph and telephone material and radio receiving sets.

Trade Announcements

As from April 2nd the businesses of British Mechanical Productions, Ltd., and Lectro Linx, Ltd., which have for some time past been carried on in close collaboration, were transferred to a new company, British Mechanical Productions, Ltd., which will continue to carry on the same businesses under substantially similar management as before. The new company has taken over all the assets of the old companies, subject to all liabilities accrued since April 1st. British Mechanical Productions, Ltd. (old company) and Lectro Linx, Ltd., are going into voluntary liquidation. The new company has a paid up share capital of £125,000.

Davis Myer & Co., electrical engineers and contractors, are removing on April 12th to 4-10, Chenies Street, Tottenham Court Road, W.C.1 (telephone: Museum 3463).

The telephone number of the British Electric Resistance Co., Ltd., Ohmic Works, Queensway, Ponders End, has been changed to Howard 1492 (private branch exchange).

A Lucky Girl

The King has invited Miss Doris Griffiths of the General Electric Co., Ltd., to attend the Coronation ceremony in Westminster Abbey. It was the wish of the King that four workpeople representative of British industry should be his guests on this historic occasion, and the task of making the selection

Miss D. Griffiths (on the extreme right) working at the bench at the G.E.C. Witton Works

was entrusted to the Industrial Welfare Society of which he had been President for some years. Miss Doris Griffiths, who is twenty-one years of age, is employed in the Small Motor Appliance Department of the G.E.C. Engineering Works, Witton, Birmingham. On Monday last Miss Griffiths broadcast her impression of the honour accorded her.

E.D.A. (Coventry Circle) Dinner

The annual dinner of the Coventry Circle of the British Electrical Development Association was held on March 22nd at the King's Head Hotel, Coventry, when Lt.-Commdr. Neal (Area Officer), in proposing the toast of "The Coventry E.D.A. Circle," referred to the happy relations which existed between electrical suppliers and contractors. While there were Circles going to pieces in all parts of the country, it was encouraging to find such a healthy state of affairs in Coventry. Mr. F. C. Dain (secretary of the Circle), who responded, said that so long as the co-operation between the suppliers and contractors existed there could be no doubt that the electrical industry locally would continue to progress at the phenomenal rate it had during the past few years. It was only by the co-operation of all sections that difficulties which arose could be overcome, and he appealed for the continuance of the support the Circle had enjoyed in the past.

Price Increases

M.K. Electric, Ltd., announces that owing to the increased costs of materials and labour their selling prices have been advanced by 5 per cent.

Elliott Bros. (London), Ltd., have increased the price of all their miniature pattern instruments by a further 5 per cent. making 10 per cent. in all.

L.E.P.'s Staff Welfare Schemes

To keep members of the staff throughout its scattered area in close touch with one another, so as to encourage harmonious working and a fuller understanding of all sides of the company's work, the Lancashire Electric Power Co. has provided club facilities and a quarterly news bulletin is being issued. Following these recent developments employés' visits from one part of the area to another are being encouraged. A recent example is the visit of Manchester Head Office employés to the Kearsley Power Station to view the extensions. Our picture shows a group of the Manchester office staff who "downed pens" on March 22nd, and boarded the company's private bus bound for Kearsley.

A Survey of Coronation Lighting Plans

An increased load of approximately 100,000 kW is expected as a result of national and local government plans for Coronation celebrations. This figure is arrived at following a preliminary survey conducted by the E.L.M.A. Lighting Service Bureau with a view to acquainting and keeping the industry informed of Coronation lighting developments and requirements. The survey, which embraces relatively small places as well as the large cities, shows that already the lighting load is double that used during the Jubilee. Even in the smallest country villages buildings and places of local interest will be illuminated. Floodlighting is naturally the most popular form of illumination for buildings with large fronts, but strip lighting, outlining and festooning follow it closely in point of popularity and in this connection it is calculated that more than five million extra lamps will be used. In many cases the local authorities have signified their intention to continue the lighting permanently. In others, mainly seaside towns and holiday resorts, the decorations will be kept on during the summer months. Historic buildings have been selected in the majority of cases for floodlighting, especially where a large surface is concerned. Tungsten filament lighting is being used for outlining smaller buildings and for squares and main roads. Many ideas well adapted for artistic lighting are to be noted among the plans for illuminations. At Haslingden, the buses are to be illuminated; York is picking out the bars of the main city gates with decorative lighting; Cheltenham is floodlighting the promenade trees with mercury electric-discharge lamps, and using amber lamps along each side of the road; Bedford is ornamenting an island with an illuminated waterfall, with changing colours and fairy lamps among the trees. All these arrangements are being carried out by local authorities. They by no means represent the whole activity of Coronation lighting, since it is estimated that these efforts will be rivalled by the decorative lighting carried out on business and private premises. The use of light in this way is likely to result in the load of 100,000 kW being nearly doubled, while the demand for lamps will rise to more than ten millions. To complete its survey the E.L.M.A. Lighting Service Bureau asks all chief engineers of supply undertakings not already approached to send to 2, Savoy Hill, London, W.C.2, details of the lighting plans in their areas.

Telephone Systems on Ships

The vessel at present known as No. 552, a sister ship of the *Queen Mary*, which John Brown & Co., Ltd., are building at Clydebank is, like her predecessor, to be equipped with a comprehensive telephone system. This is now being manufactured at the Coventry Works of the G.E.C. The system in the *Queen Mary* is manual, embracing 585 lines. It has been found to provide every facility required of a telephone system for the ship's passengers and other service requirements. The system is also employed for public address purposes. Two other vessels in course of construction which are also to be equipped with telephone systems supplied by the General Electric Co., Ltd., are the s.s *Stratheven* and the s.s. *Strathallan*. Passengers' requirements on board these P. & O. boats will be met by 400-line switchboards serving lines to telephones in cabins and many other parts of these vessels.

The Drumm Battery

The report of the Comptroller and Auditor-General (Mr. G. McGrath) on the Irish Free State public accounts for the financial year ended March 31st, 1936, which has just been issued, shows that the total amount advanced for research and development in connection with the Drumm battery to March, 1936, was £87,913, in addition to which a grant of £1,800 was made for the relief scheme vote. Terms of repayment have not yet been determined.

Engineers in South Africa

According to a *Central News* message from Durban, the industrial boom which is being experienced in South Africa is causing a shortage of technical men. Mr. J. H. Gyles, the city electrical engineer of Durban, recently stated that he had lost his chief mechanical engineer and power station superintendent who had secured industrial posts. He said that it was becoming increasingly difficult to keep a nuceleus of men with the necessary training to fill the more responsible positions in the Corporation Electricity Department as they became vacant.

Members of the Head Office staff of the L.E.P. Co. setting off for Kearsley power station

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. April 7th.	Fortnight's Inc. or Dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac... ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£261	£11 dec.
Grade II ... ... ,,	£183	£6 dec.
Grade III ... ... ,,	£100	—
c Brass (rolled metal 2" to 12" basis) ... per lb.	10½d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	1/1½ to 1/1¾	¼d. dec.
c ,, Wire, basis ... ... ,,	10¼d.	¼d. dec.
c Copper Tubes (solid drawn) ... ... ,,	1/3½	¼d. dec.
g ,, Bars (best selected) ... ... per ton	£104	£3 dec.
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£72 10s.	£4 10s. dec.
d ,, ,, Wire Rods ... ,,	£77 10s.	£3 10s. inc.
d ,, ,, H.C. Wire ... per lb.	10¾d.	½d. dec.
f Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/9	—
f ,, Sheet ⅛" thick & up ... ... ,,	1/7 to 1/10	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/6	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	1s.	½d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£31	£3 dec.
g Mercury ... ... per bot.	£14 7s. 6d.	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/3½	½d. inc.
p ,, ,, drawn bars & rods ,,	1/4½	½d. dec.
p ,, ,, rolled strip & sheet ,,	1/2½	½d. dec.
p ,, ,, wire ... ... ,,	1/4¾	½d. dec.
o Platinum ... ... per oz.	£11 15s.	—
d Silicium Bronze Wire ... ... per lb.	11½d.	½d. dec.
g Spelter... ... ... per ton	£30 2 6	£3 dec.
r Steel, Magnet, in bars ... ... per lb.	7½d.	—
g Tin, Block (English) ... ... per ton	£283	£14 10s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes."

For Sale

Goddard & Smith will sell by auction on April 14th at 13, High Holborn, W.C., a stock of electrical material.

Finchley Electricity Department has for sale one 500-V 300-Ah battery.

Salford Corporation invites offers for a 1,000-kW rotary convertor.

Goddard & Smith will sell by auction on April 19th at 70, Seymour Place, W.1, an 8-cwt. electric van.

Mr. A. D. Russell will sell by auction at Jubilee House, Westgate Road, Newcastle-upon-Tyne, the stock of Dulcetto Polyphon, Ltd. (in voluntary liquidation).

The Yorkshire Electric Power Co. invites offers for the purchase of two 6,000-kW turbo-alternators.

(See our classified advertisements.)

Lancashire Dynamo Activity

Lancashire Dynamo & Crypto, Ltd., reports that orders received during March show an increase of 30 per cent. over the corresponding period last year and constitute a record for any month in the company's history. The orders include motors for boiler house auxiliaries, planer drives, geared motor units and turbo-alternators up to 5,000 kVA. Their destinations cover all parts of the world, including in particular Sweden, Holland, China, India, Australia, South Africa and Canada.

New Catalogues and Lists

Hackbridge Electric Construction Co., Ltd., Walton-on-Thames.—A leaflet dealing with transformers.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Details of decoration lamps for the Coronation and a 48-page catalogue of electric light fitting accessories.

Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, London, W.C.2.—A list of "Elasta" electric lamps.

Crompton Parkinson, Ltd., Bush House, London, W.C.2.—A booklet on pedestal fans.

Wholesale Fittings Co., Ltd., 23-27, Commercial Street, London, E.1.—Supplement No. 304 showing Coronation lighting fittings.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, Kingsway, London, W.C.2.—A leaflet illustrating "Sunray Tricity" fires.

Croydon Engineering Co., Ltd., Commerce Way, Purley Way, Croydon.—A copy of the "Syncroy" synchronous motor catalogue.

Higgs Motors, Ltd., Witton, Birmingham, 6.—New catalogue sections dealing with induction motors.

Constructors, Ltd., Nickel Works, Tyburn Road, Erdington, Birmingham.—A folder dealing with slotted steel, for use in connection with Coronation displays, frameworks, staging and switchboards.

Morse Chain Co., Ltd., Letchworth.—A 48-page catalogue of chain drives.

Bankruptcy Proceedings

L. J. Powell, 209, High Town Road, Luton, radio engineer.—The public examination herein was held at the Public Library, Luton, recently. According to the statement of affairs filed there were unsecured creditors' claims amounting to £161, while the assets were estimated to realise, net, £50, leaving a deficiency of £111. Debtor attributed his failure to taking over the liabilities of a partnership and bad trade. The examination was formally adjourned.

A. J. Phillips, wireless and domestic appliance dealer, 68, Marine Parade, Brighton.—Receiving order made March 24th on a creditor's petition.

G. E. King, wireless dealer, 489, Eastern Avenue, Ilford.—Receiving order made March 24th on a creditor's petition.

N. Hall (Hall & Co.), wholesale and retail radio dealer, 66, Margaret Street, Ashton-under-Lyne, and as Horners at 278, Stamford Street, Ashton-under-Lyne.—Trustee, Mr. F. E. Bendall, 31, Lloyd Street, Manchester, appointed March 25th.

G. E. Hallam (Midland Radio Service), wireless and electrical engineer, 342, Meadlow Lane, 191, Arkwright Street and 275a, Arkwright Street, Nottingham.—Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver, released March 23rd.

G. F. Richards, wireless and electrical dealer, 1, Peel Street, Kidderminster.—Receiving order dated May 2nd, 1934, rescinded and order of adjudication dated May 2nd, 1934, annulled on the grounds of payment of debts in full.

Company Liquidations

Electrical Instruments (Leeds), Ltd.—Winding up voluntarily. Liquidator, Mr. A. W. Macredie, Orchard Chambers, Church Street, Sheffield.

Radio & Electrical Services (Beaminster), Ltd.—Winding up voluntarily. Liquidator, Mr. M. W. Burrough, 10, South Street, Bridport.

Private Arrangement

G. W. Linsell, radio dealer, 26, London Road and 72, Catherine Street, St. Albans.—The creditors herein were called together recently when the statement of affairs showed ranking liabilities of £1,331, and in addition there were fully secured creditors for £467. The total assets were £616, leaving a deficiency of £715. There was a footnote to the statement to the effect that there were contingent liabilities under guarantees given in connection with hire-purchase finance. Resolutions were passed in favour of the matter being dealt with under a deed of assignment in favour of C. Latham, of 185-188, High Holborn, London, W.C., with a committee.

Providing Industrial Power Plant

TO assist the industrialist to secure early deliveries of power plant and machine tools is one of the declared objects of Kessel (Power Plant), Ltd., whose new works at Heather Park Drive, Wembley, were opened at the beginning of this year. The basis of the company's activities is the "re-manufacture" of used steam, oil or gas engines and other machinery. Worn parts are obtained direct from the makers, with whom close co-operation is maintained.

The main shop, measuring 180 by 60 ft., is equipped with a test bed rated at 1,200 h.p., a Heenan & Froude brake, a 5,000-gal. water tank, a 15-ton Morris travelling crane and the requisite machine tools. During a recent visit we observed that engines undergoing overhaul ranged from 1.5 to 750 h.p., and that electrical plant being re-wound and reconditioned (normally selected from the stock of Messrs. J. Gerber & Co., Ltd., an associated firm) was of capacities up to 350 kW.

The erecting shop at the Kessel works

Many of the sets had been ordered for export, such as one of 500-h.p. for Finland, another of 200 h.p. for Bagdad, and a 14-ton compressor for Basrah.

An unusual feature of the company's work is the provision of power stations for industrial works. An architect is retained to design the buildings and the company builds the foundations, supplies lifting tackle, erects the generating plant and hands over the installation to the owner insured at Lloyd's for a year against breakdown.

Generating sets in any station are all of the same type and should the full requirements not be obtainable from stock, complete new units are purchased from the original manufacturers. Running costs will be guaranteed on the basis of those ascertained on the test bed after taking into account local conditions. We were shown the figures on which one private plant is being laid down, as worked out by the public supply undertaking, which had put forward a competing offer.

The maximum demand was 380 kW and the consumption 418,000 kWh per annum. For mains supply the annual kW charges were £1,727 and the energy charges (at 0.4d. per kWh) £697. Account had also to be taken of depreciation on the capital expenditure that would have been incurred on cables, transformers and switchgear, motor generator and synchronous motors amounting to £2,900. Taking depreciation at 10 per cent., the total annual cost of mains supply thus became £2,714, giving an overall kWh charge of 1.56d. Costs per kWh generated with remanufactured Diesel plant were calculated as follows: Fuel, 0.66 lb. per kWh at £5 per ton, 0.353d.; lubricating oil, 0.2 gal. per hr. at 2s. 6d. per gal., 0.031d.; attendance, £200 per ann., 0.114d.; repairs and maintenance, 8 per cent. of the previous items, 0.041d.; stores and water, 5 per cent. of same items, 0.024d.; depreciation, 10 per cent. on capital cost, 0.114d.; total, 0.677d. The total running cost thus becomes £1,183. Capital outlay on the 380-kW Diesel was £1,875 ex works, plus £650 charged for delivery to site, erection, new gear and foundations, or £2,525 in all.

The company is also engaged on a design for warming lubricating oil on a 500-hr. change schedule; for this immersion heaters are fitted to streamline filters. It has also prepared schemes for the use of hot jacket water for heating, chiefly in plating works. Another activity is the provision of maintenance service, fitters being available at any time, night or day, to undertake urgent repair work in any part of the United Kingdom.

Electricity Supply

Lighting, Domestic, Power

Axholme (Lincolnshire).—ELECTRIC STREET-LIGHTING SCHEME.—Representatives of the North Lincolnshire and Howdenshire Electricity Co. attended a special meeting of the Isle of Axholme Rural District Council recently when an electric street-lighting scheme was discussed. At present the only street lighting is by gas at Crowle and Epworth. The matter was deferred until after the elections. In the course of the discussion one of the representatives of the company promised that Althorpe would have an electricity supply within four weeks.

Bolton.—STREET LIGHTING.—The proposed new road from Heaton to Astley Bridge is to illuminated by sodium electric-discharge lamps, the cost of the installation being estimated at £3,722.

LOAN.—The Electricity Committee has obtained sanction to borrow £13,930 for mains, sub-station, building and equipment in the Lostock district.

Bridlington.—CHEAPER ELECTRICITY.—The Town Council has adopted the following reduced scale of charges as from the meter readings for the March quarter:—Lighting, up to 1,000 kWh per quarter, 4d. per kWh; exceeding 1,000 kWh per quarter, 3½d. per kWh. Outdoor signs or illuminations, 3½d. per kWh. Cinema purposes (apparatus only), 3d. per kWh. Refrigerating plant, 1d. per kWh. Heating and power, from 3d. to 1d. per kWh, according to quantity. Domestic tariff, where coal and electricity, or only electricity is used for cooking, ¾d. per kWh (except lighting). Two-part tariff, an annual fixed charge of 15 per cent. of the current rateable value of the premises and a running charge of ¼d. per kWh. Minimum charge per quarter, excluding meter rent, 7s. 6d. There is a discount of 5 per cent. for prompt payment of accounts.

Bridge-Blean.—SUPPLY TO HACKINGTON.—The Kent Electric Power Co. proposes to erect an overhead line to afford a supply to Hackington. The Bridge-Blean Rural District Council is, however, urging that underground cable should be used owing to the narrowness of the road.

Cheltenham.—FIXED CHARGE LOWERED.—Where the number of rooms in a house exceeds five the domestic two-part tariff fixed charge in respect of those in excess of that number is to be 2s. 6d. per quarter per room instead of 5s.

Darlington.—ADDITIONAL GENERATING PLANT.—Application is to be made for sanction to borrow £299,450 for extending the generating plant at the electricity works.

Derby.—EXTENSIONS.—The Town Council is to spend £215,799 on electricity extensions, including dust-extraction plant, £12,649; switchgear modification, £6,350; sub-station building and equipment, £32,500; and mains and services, £70,000.

Dumfries.—CONCESSIONS.—Hitherto appliances sold under hire-purchase agreements were limited to those costing £2 or more, but the Council has recently approved a recommendation by the Electricity Committee that the restriction should be removed. A Coronation rebate of 25 per cent. is to be allowed off consumers' accounts and collections for the quarter ending April 30th.

Dover.—TWO-PART TARIFF FURTHER DISCUSSED.—During an interview Mr. J. M. Kennedy (Electricity Commissioner) impressed upon a delegation from the Electricity Department the desirability of introducing a two-part tariff (ELEC. REV., January 15th, page 110). Since then the question has been further discussed by the Electricity Committee. While it is in favour of the adoption of a two-part tariff, it is of the opinion that, in view of the considerable expenditure which the Corporation is incurring in connection with the change of frequency and pressure and in other directions, such a tariff should not be introduced before April 1st, 1938, at the earliest, by which date a considerable reduction will be effected in the amount of loan charges payable in respect of the undertaking; that the most suitable method of assessing the fixed charge in respect of domestic premises will probably be on the area-of-house basis, and in respect of business premises a standing charge of 6s. per quarter per 100 W of lighting installed (£12 per kW per annum) plus a running charge of ¼d. per kWh in each case.

SUPPLY TO CHURCH WHITFIELD.—As a number of houses have been erected at Church Whitfield and there is building land suitable for development, the Electricity Department proposes to provide a supply to the district. It will be necessary to extend the high-voltage cable underground from the top of Whitfield Hill and to supply the houses by overhead lines.

Dutch East Indies.—INCREASED OUTPUT.—The quantity of electricity generated during the last three months of 1936 was 28,816,706 kWh, an increase of 3.6 per cent. over the preceding quarter and 11 per cent. over the corresponding period of 1935. The total production for the year was 110,858,372 kWh, the highest total yet recorded.

Eastbourne.—COOKER MAINTENANCE.—A maintenance scheme by the Electricity Department is to be available to consumers who provide their own cooker and/or water-heater and wash-boiler. The charge will be 5s. per quarter.

Guildford.—GENERATING STATION EXTENSIONS.—A scheme for the extension of the generating station at a cost of £78,500 has been approved by the Council.

CHANGE-OVER.—The Electricity Committee is to complete the change-over at a cost of £11,250 and £3,402 is to be spent on mains extensions.

Hornsey.—SODIUM LIGHTING.—The Highways and Lighting Committee is of the general opinion that sodium lamps will offer the best system of street illumination when the present gas lighting is replaced by electricity.

Hull.—SUB-STATIONS AND EQUIPMENT.—Sanction has been obtained by the Electricity Committee to borrow £50,000 for sub-stations and equipment.

Irish Free State.—PROGRESS OF THE LIFFEY SCHEME.—Several important engineering concerns on the Continent, in addition to English companies, have submitted tenders for carrying out the major part of the Liffey hydro-electric and water-supply scheme. The Continental firms represented include the Siemens organisation, which carried out the Shannon Scheme, and leading Dutch and French contractors. One Irish company has tendered for the major part of the contract. The Dublin Corporation, which is co-operating with the Electricity Supply Board, has invited tenders for laying a water main, 5 ft. in diameter, from the reservoir to be created above Poulaphouca to filter beds in the neighbourhood of Clondalkin. According to the joint plan of the Corporation and the E.S.B., the whole of the work is to be completed by 1940. A later stage of the Liffey Scheme provides for the establishment of another power house at Goldenbridge Falls, lower down the river on the Ballymore-Eustace side of Poulaphouca. For some time past trial pits have been dug in the neighbourhood of the area in which the reservoir is to be created. From these pits engineers have discovered that they will have to tunnel through rock in order to construct the intake for the new power house. This tunnel, which will start from the reservoir a short distance from the dam, will be about 18 sq. ft. in area at its face; it will be cut through the rock for a distance of about 1,300 ft. to the power house, which will be built just below the Poulaphouca Falls where the river makes a sharp bend to the left. The gorge is about 100 ft. deep at this point, and the quantity of water flowing through it will be virtually reduced to a trickle when the dam is built. The line of the tunnel from the reservoir to the power house has already been marked out by the engineers and surveyors. The dam is to be constructed about 150 yd. on the Blessington side of the falls, and it will be about 15 ft. thick at the base.

Leeds.—CHEAPER ELECTRICITY FOR FURNACES.—The Electricity Committee proposes to allow a special discount of 25 per cent. off the "unit" charge for electricity for electric furnaces where the installation is not less than 100 kW and where consumption for this purpose exceeds 250,000 kWh per annum.

London.—ST. PANCRAS.—Euston Road is claimed to be the first thoroughfare in London to be permanently lighted by electricity. It was in January, 1892, that its first electric street-lighting installation was completed, and on Friday last another stage in the history of its illumination was reached when the Mayor, Ald. R. F. W. Fincham, inaugurated a new installation consisting of eighty-one 400-W Siemens electric-discharge lamps. With the newly lighted thoroughfare the borough now possesses nearly six miles of roads illuminated by electric-discharge lamps, or over one-third of its first- and second-class roads. Before the switching-on ceremony the chairman of the Electricity Committee, Ald. J. H. Mitchell, explained the Council's reasons for adopting the new type of lighting, and declared that although the new illumination was three times greater than its predecessor its cost was only 30 per cent. higher. The various steps in the development of the electric-discharge lamp were lucidly outlined by Mr. G. Hughes, of Siemens Electric Lamps and Supplies, Ltd., which company was responsible for the installation. The lamps employed are of the "Sieray H" or high-pressure mercury type with an initial luminous output of 18,000 lumens. The current through the lamps is limited and controlled by choke coils of the variable-air gas type, power-factor correction being achieved by means of metal-shrouded condensers. In some cases existing columns were adapted for use and the new columns have been carefully designed to match the older type. Brackets of the swan-neck type are spigot-mounted on the columns, the bases of which house the control apparatus. Special prismatic glass panels incorporated in the "Regent" type lanterns give an asymmetric light distribution with the main beams at 160 deg. to each other and ensure even illumination of the road surface without undue striation. The whole installation falls into Class C of the B.S.S. for street lighting, with the minimum illumination greater than 0.5 ft.-candles.

STEPNEY.—A special lantern incorporating a "Sieray-Dual" electric-discharge lamp is being experimented with, and the installation of ten units in Whitechapel High Street at Gardiner's Corner and in Commercial Road East for trial purposes has been authorised.

The borough electrical engineer and manager is to purchase 100 electric water-heaters for inclusion in the domestic hire scheme, and is to report to the Electricity Committee in due course as to whether the demand for and the use made of the apparatus justifies a scheme for the general supply of such appliances.

LAMBETH.—Some of the new electric-discharge street lamps in the borough were officially switched on last Wednesday. The completed section extends from the junction of Denmark Hill and Herne Hill to Norwood Road and on to the borough boundary. Altogether 1,032 "Osira" lamps are being installed in South Lambeth.

Long Eaton.—INCREASED SURPLUS.—Mr. J. B. Feltham, electrical engineer to the Urban District Council, reports that the electricity undertaking earned a total revenue of £45,178 in 1935-36, against £41,230 in the previous year, sales being 6,350,000 kWh as compared with 5,956,000 kWh. There was a net profit of £1,452, and it has been decided that £1,000 of this shall be applied to the relief of the rates.

Manchester.—STREET LIGHTING.—Provision for new fittings for lighting in outer districts at a cost of £5,000 and the extension of high-voltage mains at a cost of £6,900 are to be undertaken by the Electricity Committee.

MAINS.—The Electricity Committee has obtained sanction to borrow £100,000 for mains.

New Zealand.—SYSTEM INTERCONNECTION.—Acquisition by the New Zealand Government of the Southland power undertaking, which serves the southernmost portion of the South Island, is to be followed by interconnection of this system with the Waitaki and Lake Coleridge undertakings, states the *Electrical Engineer and Merchandiser*. A 100,000-V transmission line is to be constructed over the distance of approximately 100 miles between Dunedin and Gore, the actual connection being made between the Halfway Bush sub-station, which at present serves Dunedin, and a new sub-station near Gore. A contract has been placed for more than 1,500 Australian hardwood poles for the line supports. At the Gore sub-station transformers will be installed to link the 100-kV line with the existing 66-kV Southland transmission system. By this means the resources of the Waitaki and Lake Coleridge hydro-electric stations, which are already interconnected, will be made available to assist the Lake Monowai station.

Norway.—POWER STATION EXTENSION.—An amount of 2,500,000 kr. is to be spent by the company owning the Hoyanger hydro-electric works on extensions to increase the output of aluminium to 7,500 tons per annum (3,000 tons more than at present).

Peterborough.—LOANS.—Application is being made by the City Council for sanction to borrow £8,054 for a sodium electric-discharge lighting installation in the principal streets. Sanction is also being sought to borrow a further £5,000 for the purchase of meters and £5,000 for the provision of sub-stations.

Portland.—AN ELECTRIC COOKER ACHIEVEMENT.—Just before Easter the Electricity Department installed its 500th electric cooker, the event being signalised by Councillor A. J. Pike, chairman of the Electricity Committee, presenting an electric iron to the wife of the consumer concerned. As there are 1,220 consumers (all domestic) in the area, the proportion using electric cookers is now one to 2.44, which Mr. F. O. Harber, the electrical engineer, believes to be a record for this country.

Scarborough.—WATER-HEATER HIRE CHARGES.—A new scale of charges for the hire of electric water heaters has been introduced by the Town Council. For an immersion heater with hand control switch (including fixing and wiring up to 30 ft.) the rate is 3s. per quarter, and for an immersion heater with thermostat 4s. 6d. per quarter. The charges for storage heaters range from 3s. 6d. per quarter for a 1½-2-gal. capacity heater to 7s. 6d. for a 12-gal. one.

SUB-STATION.—The Town Council has decided to apply to the Electricity Commissioners for sanction to borrow £2,005 for changing the position of a sub-station on the Northstead Estate and erecting a sub-station near Cook's Row. The borough electrical engineer is to prepare estimates of the cost of erecting a sub-station at Wheatcroft.

OVERHEAD LINES.—Application has been made to the Town Council for sanction to erect overhead lines at Brompton-by-Sawdon and Seamer.

Sheffield.—SWITCHROOM.—A new switchroom is to be built at Neepsend power station at a cost of £5,450.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £2,567.

SUPPLY TO ESTATE.—Sanction has been obtained to borrow £3,503 for the supply to the Parsons Cross estate.

South Wales.—OVERHEAD LINES.—Work has commenced upon the erection of overhead lines at Rhigos, in the upper part of the Neath Valley, by the South Wales Electric Power Co. About four miles of distributing lines will consist of 3,300-V and 230-V conductors, both sets being mounted on the same poles.

Spenborough.—LOWER POWER CHARGES.—Last October the Urban District Council approved reductions in the domestic tariff of the Electricity Department. Mr. A. Pickersgill, the engineer and manager, now informs us that the power charges have been amended in favour of consumers as from the beginning of this month. For consumers taking 50 kVA or more there is a standing charge of £3 per annum per kVA of demand during January in any year. If the January demand is exceeded during the year a charge of 5s. per kVA per month is to apply to the higher demand, and this will continue until the demand is exceeded. For the first 10,000 kWh per month there is a running charge of 0.6d. per kWh; for the next 10,000 kWh, 0.5d. per kWh; for the next 30,000 kWh, 0.4d. per kWh; and for all in excess, 0.3d. per kWh, subject in all cases to the standard coal clause. For restricted hour supplies there is a rate of 0.65d. per kWh, with 10s. half-yearly for control switch rental. The consumer is to undertake to refrain from using the supply between the hours of 4 p.m. and 6 p.m. during the months of November, December, January, and February, with the exception of 10 per cent. of the power demand, which may be used for lighting purposes only.

Stoke-on-Trent.—ASSISTED WIRING.—Sanction is being sought by the Electricity Committee to borrow £50,000 for assisted-wiring installations.

EXTENSIONS.—The Committee is to provide a three-phase supply in Bucknall New Road, Hanley, at a cost of £800, and has obtained sanction to borrow £4,250 to enable a supply to be provided to newspaper offices at Hanley.

SUPPLY EXTENSION.—The Town Council is to afford a supply of electricity to Longbridge Hayes.

Uphall (West Lothian).—CHEAPER ELECTRICITY.—In view of the satisfactory financial position of the electricity undertaking the Lighting Committee is making reductions in the charges to large consumers and householders. To commercial consumers of over 10,000 kWh a reduction of ½d. per kWh will lower the charge to 1½d. per kWh.

Uruguay.—HYDRO-ELECTRIC SCHEME.—It is reported in the German Press that the Government of Uruguay has placed a contract with a German syndicate of six firms for the construction of a dam, hydro-electric works and transformer stations.

Westmorland.—INQUIRY.—The Central Electricity Board has decided to ask the Ministry of Transport to hold an inquiry into the Board's scheme for the erection of overhead lines from Kendal to Staveley on the main Windermere road. The project is being opposed by Westmorland County Council, Kendal Town Council, and South Westmorland Rural District Council. The Central Electricity Board has refused to place the lines underground.

West Wemyss.—STREET LIGHTING.—The Fife Electric Power Co. is laying cables for street lighting. Last summer the Council decided to provide electric lighting and sold the existing gas lamps. Difficulties regarding wayleaves, &c., resulted in the area being without public lighting throughout the winter.

Traction

Italy.—RAILWAY ELECTRIFICATION.—On April 21st the electrification of the railway line from Naples *via* Battipaglia and Reggio to Calabria will be completed, learns *Reuter's Trade Service* from Rome. This will add another 450 km. of electrified line to that already in existence. By 1939, with electrification of the lines from Pisa to Rome, from Milan to Bologna, from Bologna to Ancona on the Adriatic, and perhaps from Chiasso to Milan, the whole electrification programme will have been completed. With the exception of Piedicolle-Gorizia all the frontier passes will also have been electrified.

Leeds.—COLOUR-LIGHT SIGNALS.—A colour-light signalling system was this week put into operation at the west end of Leeds New Station. The installation was carried out by the Westinghouse Brake and Signal Co.

Manchester.—TROLLEY-BUSES.—Sanction has been obtained to loans of £103,800 for trolley-buses, £8,506 for overhead equipment, and £79,000 for the construction of a trolley-bus garage in Rochdale Road.

RAILWAY ELECTRIFICATION DEADLOCK.—It was reported at the annual meeting of the Manchester and District Regional Planning Committee last week that representatives of the L.M.S. and L.N.E.R. companies, after conferences with the Advisory Committee, had stated that electrification could only be considered in relation to the whole of the passenger transportation problem within a suitable radius of Manchester. Conferences with the various passenger transport undertakings within a radius of 12 to 15 miles from Manchester and the railway companies had been held, but it had not been found possible to reach agreement that the problem should be considered on the lines suggested by the railway companies and it was, therefore, impossible to make any further progress for the time being.

Southern Railway.—FATAL RAILWAY ACCIDENT.—Ten deaths resulted from a collision between two electric trains outside Battersea Park Station shortly after eight o'clock last Friday morning, twelve other persons being detained in hospital with injuries. The accident, the first fatal one in inner London since 1924, was caused by the 7.31 a.m. electric train from Coulsdon North to Victoria running into the rear of the 7.30 a.m. electric train from London Bridge to Victoria *via* Tulse Hill. A short-circuit occurred immediately, cutting off the supply.

Sunderland.—TRAM ROUTE EXTENSION.—The transport manager (Mr. C. A. Hopkins) is to prepare plans for extending the tram route from the Southwick terminus to Burntland Avenue, to serve the Marley Potts estate.

United States.—TRANSPORT SCHEME.—The Port of New York Authority has submitted to the Legislature of the State of New Jersey a plan for a comprehensive electric rapid-transit system linking northern New Jersey towns with Manhattan Island. The estimated initial capital outlay is $187,500,000. In addition to various subways, the proposals envisage electrification of portions of the main lines of the Erie and Central of New Jersey Railroads.

Weston-super-Mare.—END OF THE TRAMWAY.—The tramway will cease operation next week. The Bristol Tramways and Carriage Co., which has purchased the tramway undertaking of the Weston-super-Mare & District Electric Supply Co., will operate the services by buses.

Communications

Australia.—Radio Listeners.—The number of radio licences in force at the end of last year was 887,015, as compared with 770,152 a year before.

Great Britain.—Radio Interference Legislation.—According to the *Daily Telegraph*, the Postmaster-General was expected to announce in the House of Commons yesterday (Thursday) that he intends to introduce legislation compelling owners of electrical plant which interferes with radio reception to install suppression apparatus. This step was recommended last July by a special committee of the Institution of Electrical Engineers, on which the Post Office and the B.B.C. were represented. Noise-producing apparatus was classified in the following main categories:—Lifts in buildings, trolley-buses and trams, household electrical appliances, small electric motors, neon display signs, rectifiers for power plants, and electro-medical apparatus. The committee suggested that the Post Office should have power, subject to appeal to the Electricity Commissioners, for the enforcement of non-interference regulations.

Blind-approach Airway Equipment.—Five Lockheed Electra aircraft recently purchased by British Airways for their Continental and other air services have been equipped by Standard Telephones and Cables, Ltd., with Lorenz blind-approach receiving equipments. Lorenz equipment installed at Gatwick Airport has recently undergone detailed tests. The system installed at Croydon Airport has now been fully tested and is in operation. The approach line decided upon necessitated the main beacon being in rather close proximity to a large metal hangar and to a main road which carries a constant stream of heavy traffic. In spite of these difficulties, it has been possible to avoid any sign of false courses or interference with the correct line of approach.

Radio Relays.—There are now over a quarter of a million subscribers to radio-relay services in this country. At December 31st last there were 250,978 subscribers, accounting for 3.15 per cent. of the total radio licences issued, as compared with 231,554 at December 31st, 1935. These figures are considered very satisfactory in view of the existing licence situation which has confined operations to towns where relays were in operation when the Ullswater Committee was appointed.

Japan.—Long Radio-telephone Circuit.—*Reuter* reports from Tokio that direct radio-telephone communication between Tokio and Buenos Aires will be inaugurated on April 10th. From Buenos Aires connections will be made with other towns of Argentina, Uruguay and Paraguay. This circuit, 11,500 miles long, is claimed to be the longest in the world. The fee for a three-minute call will be 150 yen (£9). Japanese telephone subscribers will then be able to communicate with 92 per cent. of the subscribers in the world.

Russia.—Moscow-Arctic Communication.—A radio station in Moscow maintains direct communication with Yakutsk, Tixie, Igarka, Dixon Island, the fluorite mines at Amderm (in the Kara Sea), Archangel and Rudolph Land (in the archipelago of Franz Josef Land. By the opening of this year's Arctic navigation season arrangements will be made by which it will be possible for any telephone subscriber in Moscow to speak directly with friends and relatives at the Arctic stations and on ships in Arctic waters.

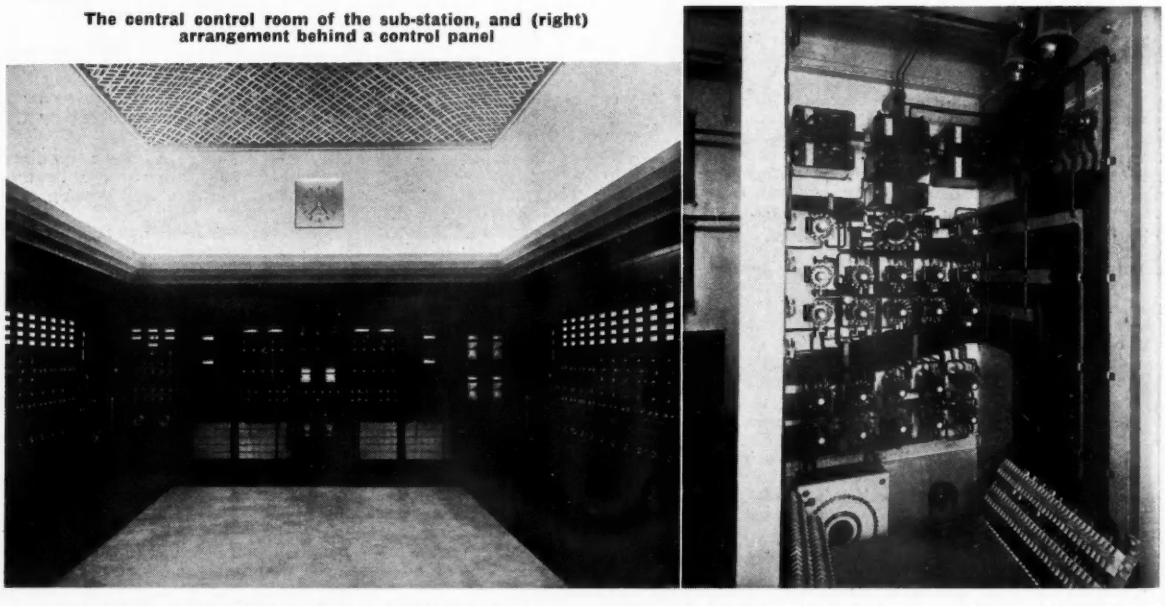
Mobile Post Offices and Radio Stations.—For the convenience of collective farmers and workers on State farms the Commissariat of Communications is organising a system of travelling post offices and radio stations. The fields of the Kharkov Province in the Ukraine will be served by 600 travelling radio stations and the Krivoi Rog by ten. Forty travelling post offices are already operating in the Dniepropetrovsk Province with regular postal delivery services to the fields.

A Paris Distributing Station

A DISTRIBUTION sub-station has just been put into service to feed the north and north-east industrial suburbs of Paris, and the towns of Saint Denis, Saint Ouen, Aubervilliers, La Courneuve, Pantin, Le Bourget, Drancy Pierrefitte and Stains.

The station has two main features. The first is the very considerable power concentrated at one point; the second is the combination of centralised control of switchgear in conjunction with the use of compressed- air for its operation. The station is fed by the Société d'Electricité de Paris, which operates the two Saint Denis power stations, and by the Société Parisienne d'Interconnexions, which operates a 60-kV interconnecting ring main around Paris and a 220-kV line from the Creney sub-station at Troyes. The service voltage of the sub-station is 12.5 kV, at which it can be supplied directly by the St. Denis generators. It is connected to the others by a 35,000 kVA Leblanc three- to two-phase transformer.

The central control room of the sub-station, and (right) arrangement behind a control panel



At present there are six incoming feeders, five of which are composed of three four-conductor cables, 0.15 sq. in. section, in parallel, and one of five four-conductor 0.39 sq. in. cables. Provision is made for two further incoming connections. In order to avoid the complete reorganisation of the network and consumers' sub-stations, that so great a concentration of power would otherwise have required, a set of reactors, limiting the short-circuit current to 23,500-A instantaneous or 8,350-A permanent load, is installed in each outgoing feeder which is protected by a 750,000-kVA Brown Boveri 600-A water-break switch. The use of water instead of oil for the extinction of the arc is expected to decrease considerably the risk of fire, and permits of a better layout.

The outgoing cables terminate in forty-six cells on the ground floor, the reactors are on the first floor and the switches on the top floor. Two of the three sets of bus-bars in the centre of the upper part of the building are normally alive, while the third set, the transfer bars, is between the cable connections on the ground floor. There are also cells for the bus-bar section switches, for the metering equipment and for the auxiliary services (twenty-two) making a total of seventy-six cells arranged in two groups on each side of a central corridor. The bus-bar section and incoming-feeder switches are of the 2,000-A Alsthom type. The section switches for the outgoing feeders are of the same type but for 320 A.

The whole sub-station is controlled by push-buttons on switchboards in a central room. From these switchboards electric-control cables go to the individual cell switchboards, where the electric impulse is changed into a pneumatic one which directly operates the switches through a short length of pneumatic tube. The cells cannot be operated from the switchboard during repair work. In this installation there are over six miles of wire and cables and over eleven miles of bus-bars.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Aberystwyth.—May 5th. Electric lighting installation at Dr. Williams' school, Dolgelly. (April 2nd.)

Barnes.—Electricity Department. Electrical installations for 146 flats and two shops. (See this issue.)

Birmingham.—April 21st. Electric Supply Committee. Two 1,000-kVA transformers. (See this issue.)

Brighouse.—April 17th. Electricity Committee. Transformers, transformer kiosk, &c., and h.v. cubicles. (April 2nd.)

Cardiff.—April 19th. Electricity Department. Electrically driven grab crane, with accessories. (April 2nd.)

Dartford.—April 24th. Borough Council. One 400-kVA transformer. (See this issue.)

Dewsbury.—April 12th. Corporation. Electrical wiring in sixty houses on the Borough Park estate. Borough electrical engineer, Bradford Road.

Dumfries.—April 22nd. Borough Council. Two 4-panel switchboards. (April 2nd.)

Egypt.—CAIRO.—April 20th. Mechanical and Electrical Department, Ministry of Public Works. Two electrically driven pumping units, with auxiliary machinery at Drain No. 7 pumping station, Northern Part of Gharbia Province. Chief inspecting engineer, 41, Tothill Street, London, S.W.1 (deposit £2 1s.).

May 18th. Pumping stations extensions at Drains No. 1 and No. 11, and modifications of Seru and Faraskour outdoor transformer stations and increasing the number of insulator units for Faraskour transmission line. Each of the stations includes two electrically driven pumping units with auxiliary machinery, &c. Chief inspecting engineer (deposit £2 1s.).

Eyemouth.—May 1st. Town Council. Electric lighting at twenty-eight houses. Town clerk (deposit £1 1s.).

Fife.—April 13th. County Council. Electric lighting at the Junior Instruction Centre, Dunfermline. G. Sandilands, county master of works, County Offices, Kirkcaldy (deposit £1 1s.).

Glasgow.—April 26th. Minister of Transport. Electrically operated swing bridge over the Caledonian Canal, Tumnahurich. Crouch & Hogg, civil engineers, 17, Lynedoch Street (deposit £5 5s.).

April 15th. Corporation. Electrical installations in sixty houses on the Elmvale housing estate. Town Clerk's Office, Room 36.

Halifax.—April 19th. Improvement Committee. Electrical work in reconstruction of premises at Crown Street. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.).

Hendon.—April 30th. Corporation. Electrical installation in the Edgware Junior and Infants' school. (See this issue.)

Huddersfield.—April 10th. Town Council. Electric wiring, emergency lighting and electric lifts for the new Public Library. Library architect, Ramsden Street.

Hull.—April 23rd. Education F. and G.P. Sub-Committee. Electrical installation at Kingston High school. (See this issue.)

Kirkcaldy.—April 12th. Town Council. Electrical supplies for twelve months. (April 2nd.)

Leyton.—April 16th. Corporation. Removing existing fittings, respacing, wiring and reinstating the electric lighting installations at two schools. (April 2nd.)

Lincoln.—May 13th. County Council. X-ray equipment. (See this issue.)

London.—STEPNEY.—April 26th. Borough Council. Electrical supplies for twelve months. (April 2nd.)

Manchester.—April 13th. Transport Committee. Fifteen 6-wheel chassis, complete with all electrical equipment, including trolley gear and power wiring, suitable for double-deck, top-covered-type sixty-eight-seater trolley-buses; fifteen metal bodies. Eighteen 4-wheel chassis, with electrical equipment, &c., suitable for double-deck, top-covered-type fifty-six-seater trolley-buses; also eighteen metal bodies. General manager, Corporation Transport Department, 55, Piccadilly.

April 13th. Cadmium copper trolley wire. General manager, Corporation Transport Department, 55, Piccadilly.

April 12th. Electricity Committee. One portable venturi meter for boiler testing at the Barton power station. (April 2nd.)

April 19th. L.v. control cables. (See this issue.)

April 22nd. Electrical stores for twelve months. (See this issue.)

Mexborough.—April 20th. U.D.C. Electricity Department. E.h.v. and l.v. p.i. cables for the period ending March 31st, 1938. (April 2nd.)

Middlesbrough.—April 19th. Electricity Department. 250-kVA transformers and 11,000-V circuit-breakers for one year. (March 26th.)

Morecambe and Heysham.—April 23rd. Borough Council. E.h.v. and l.v. overhead lines. (April 2nd.)

New Zealand.—WELLINGTON.—May 4th. Public Works Department. Insulators (T.Y. 31232.)*

May 11th. Two switch and metering cubicles. (T.Y. 31233.)* Transformers. (T.Y. 31259.)*

June 1st. Two electrically driven centrifugal pumps, with necessary electrical equipment, switchboard and control apparatus. (T.Y. 2413.)* 250-kW motor-generator set. (T.Y. 31254.)* Transmission line hardware. (T. 31255.)*

June 15th. Transformers. (T.Y. 31234.)*

July 13th. Transformer bank. (T.Y. 31258.)*

July 27th. Condenser and transformer bank. (T.Y. 31257.)*

AUCKLAND.—June 8th. Harbour Board. Three 5-ton electric semi-portal jib cranes. C. R. Butters, c/o H. H. Lloyd & Co., 41, Cheapside, London, E.C.2.

Northern Ireland.—BELFAST.—April 19th. Harbour Commission. Two double jib and one single jib 1-ton electric cranes. Harbour engineer, Harbour Office.

April 15th. Education Committee. Electric lighting at Forth River P.E. school. Education architect, Victoria Street (deposit £2 2s.).

Oldham.—April 20th. Electricity Committee. Cast-iron frames and covers for one year. (See this issue.)

Perth.—April 21st. Town Council. Electric lighting at 242 houses. T. McLaren, burgh surveyor (deposit £1).

Portsmouth.—April 20th. Electricity Undertaking. Twelve months' supply of switchgear. (March 26th.)

Salford.—April 23rd. City Council. 33-kV and l.v. pilot cables. (See this issue.)

Sheffield.—April 14th. Electricity Committee. Transformers. (April 2nd.)

South Africa.—DURBAN.—April 14th. Electricity Department. 6,600-V metal-clad switchgear. (April 2nd.)

Southend-on-Sea.—April 12th. Corporation. Electric refrigerator cabinets. (April 2nd.)

Stornoway.—April 27th. Town Council. Electrical work at seventy-four houses. Sinclair Macdonald & Son, architects, Princes Street, Thurso (deposit £2 2s.).

Warrington.—April 19th. Electricity and Transport Committee. Transformers. (April 2nd.)

West Riding.—April 10th. County Education Committee. Electric lighting in four school houses at Rossington. A. J. Dempster, divisional clerk, Winchester House, Scot Lane, Doncaster.

Whittingham (NR. PRESTON).—April 22nd. Committee of Visitors for Whittingham Mental Hospital. Electrical services at the hospital. (See this issue.)

Whitworth.—April 12th. U.D.C. Transformer and metering set, cable, joint boxes, cut-outs and compound. (March 26th.)

Wolverhampton.—May 25th. West Midlands Joint Electricity Authority. Cables for the Ironbridge generating station. (See this issue.)

Worthing.—April 12th. Borough Council. Mercury and sodium electric-discharge street lighting units, complete with steel standards and brackets. P. E. Harvey, borough engineer and surveyor, Town Hall.

---

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Birmingham.—Electricity Committee. Contracts accepted during the quarter ended March 31st: Four electric capstans and ancillary plant at Hams Hall power station.—Clarke, Chapman & Co. Two complete boiler units at Hams Hall station.—International Combustion, Ltd. Automatic split pilot protective gear at various electricity sub-stations.—A. Reyrolle & Co. Automatic voltage regulators.—Electric Construction Co.; Ferranti, Ltd. One turbo-alternator set with condensing plant and auxiliaries at Hams Hall station.—C. A. Parsons & Co. E.h.v. and l.v. cables, &c., at Hams Hall station.—Callender's. Meters.—Aron Electricity Meter; Measurement, Ltd.; Landis & Gyr; British Sangamo Co.; Chamberlain & Hookham; Ferranti, Ltd.

Glasgow.—Electricity Committee. Accepted. For the reconstruction of the main 20,000-V switchboard at the Dalmarnock power station: Six switch panels, reconstruction of forty-four existing switch panels, four reactors and alterations to bus-bars, galleries, &c., including zone protection on bus-bars.—A. Reyrolle & Co. For the extension of the distributing system: Seven 6,000-kVA transformers (£14,966).—Bruce Peebles & Co. Extension of their existing switchgear (£8,622).—A. Reyrolle & Co.

Transport Committee. Accepted. Rotary convertors for the Kinning Park sub-station (£15,224).—English Electric Co. Automatic points and crossings.—Forest City Electric Co. Underframes for 100 tramcars.—English Electric Co.

London.—L.C.C.—Wiring and fittings for electric lighting, &c., in block 2 of dwelling in the Garden Street area, Camberwell:

	£		£
Samuel Reed and Sons. Accepted	**389**	Gladwell and Cook'	469
Read and Partners	417	A. Hawkins and Sons	519
Archibald Meckhonik	428	V. T. Montrose	586
Buxton and Longley	441	Constable Hart and Co.	594
Commercial Light, Heat and Power Co.	475	Payne Bros.	687

Wiring and fittings for electric lighting, &c., in the new home for nurses at the Hammersmith Hospital:

	£		£
Duncan Watson (Electrical Engineers). Accepted	**3,280**	Read and Partners	3,923
A. Meckhonik	3,440	Jacob, White and Co.	3,930
G. E. Taylor and Co.	3,533	A. Hawkins and Sons	4,091
S. Reed and Sons	3,753	Ellis and Ward	4,210
Pinching and Walton	3,865	H. J. Cash and Co.	4,540
		Barlow Bros. and Co.	4,670

Wiring and fittings, &c., in connection with the extension and alteration of the nurses' home at Caterham Hospital:

	£		£
Bower Engineering Works (Electrical and General). Accepted	**1,588**	Ellis and Ward	1,768
Malcolm and Allen (London) ...	1,655	Berkeley Electrical Engg. Co. ...	1,795
G. E. Taylor and Co.	1,691	Francis Polden and Co.	1,801
B. French	1,730	F. G. Edey and Co.	1,811
Jacob, White and Co.	1,755	A. J. Jewens and Sons	1,938
		Springvale Electrical Co. ...	1,986

Wiring and fittings for electric lighting, heating and power at the Jessop Road school, Norwood:

	£		£
E. and C. Champion. Accepted ...	777	Pemberton and Sturgess (Great Britain)	999
Anderson, Angell and Co. ...	878	W. H. Gaze and Sons	1,066
J. L. Shadwell	883	Francis Polden and Co.	1,090
Springvale Electrical Co. ...	905		
Holliday and Son (Electrical) ...	905		

Manchester.—Electricity Committee. Accepted. Batteries for electric vehicles.—Fuller Accumulator Co. 33,000-V feeder cable.—Callender's. Electric cookers for twelve months.—Carron Co.; Simplex Electric Co.; English Electric Co.; Moffats, Ltd.; Revo Electric Co. Control cables at the Barton power staion.—Connolly's (Blackley); Hackbridge Cable Co.; Mersey Cable Works. Modifications to steam-heating pipes at the Dickinson Street station.—Babcock & Wilcox.

Transport Committee. Accepted. Overhead trolley equipment fittings.—B.I. Cables; A. Wiseman & Co. Twelve traction feeder boxes.—Boydell & Sons.

Education Committee. Accepted. Electrical installations at Bowker Vale school.—A. Loudon; at residential open-air school.—J. Collier & Co.

Salford.—Light, Heat and Power Committee. Accepted. Supplies for twelve months: Joint boxes.—Beecroft & Wightman. Meters.—British Electric Meters; B.I. Cables; Ferranti, Ltd.; Met.-Vick. Elecl. Co.; Rex Meters. Transformers.—Hackbridge Electric Construction Co.; British Electric Transformer Co. Switch units.—Ferguson, Pailin; Met.-Vick. Elecl. Co. Switchgear.—English Electric Co.; Met.-Vick. Elecl. Co. Cable tiles.—H. J. Baldwin & Co. Joint box compound.—Blackall Bros.; Berry's, Ltd. Trough filling compound.—Berry, Wiggin & Co. Meter boards and battens.—Thomas De Halle. Electric washboilers.—S. Simister & Co. Electric fires.—Falkirk Iron Co. Electric motors.—Crompton Parkinson; Laurence, Scott and Electromotors. Starters for electric motors.—Allen West & Co.; G. Ellison; Erskine, Heap & Co. Breakfast cookers.—Walker, Hunter & Co. Switch-fuses.—W. E. Beardsall & Co.; G.E.C. Switches.—Lawrence & Nicholas.

Stoke-on-Trent.—Electricity Committee. Accepted. Overhead lines.—Callender's. Sub-station switchgear.—Met.-Vick. Elecl. Co.

Sutton & Cheam.—Borough Council. Accepted. Electrical installation at the new baths and public hall, Cheam.—Alpha Manufacturing & Electrical Co.

Worthing.—Electricity Committee. Accepted. Cables for twelve months.—Britannic Electric Cable Co.

Forthcoming Events

Institution of Electrical Engineers.—Monday, April 12th. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "Steam Generation and Maintenance in Relation to Grid Control." To be opened by Mr. L. M. Jockel. Thursday, April 15th. Institution, London. 6 p.m. "Modern Systems of Multi-Channel Telephony on Cables." Col. A. S. Angwin and Mr. R. A. Mack.

North-Eastern Centre.—Monday, April 12th. Armstrong College, Newcastle-upon-Tyne. 6.15 p.m. Annual general meeting. "Modern Factors Affecting Electricity Costs and Charges." Mr. J. H. Sumner.

Scottish Centre.—Tuesday, April 13th. 39, Elmbank Crescent, Glasgow. 7.30 p.m. Annual general meeting. "A Survey of Marine Radio Progress, with Special Reference to R.M.S. *Queen Mary*." Cmmdr. F. G. Loring and Messrs. W. L. McPherson and W. H. McAllister.

Western Centre.—Tuesday, April 13th. Institute of Preventative Medicine. Cardiff. 8.30 p.m. Joint meeting with the Cardiff Medical Society. "Cineradiography." Dr. R. J. Reynolds.

Hampshire Sub-Centre.—Wednesday, April 14th. University College, Southampton. 7.30 p.m. Short papers to be read and discussed.

Transmission Section.—Wednesday, April 14th. Institution, London, W.C.2. 6 p.m. "The Use of Protective Multiple Earthing and Earth Leakage Circuit Breakers in Rural Areas." Mr. H. G. Taylor.

Meter and Instrument Section.—Friday, April 16th. Institution, London, W.C.2. 7 p.m. "The Photo-cell and its Applications in Industry." Mr. J. B. Kramer.

Electrical Industries Benevolent Association.—Friday, April 9th. Savoy Hotel, London, W.C.2. Annual general meeting and luncheon.

Institution of Engineers-in-Charge.—Friday, April 9th. Holborn Restaurant, London, W.C.2. Annual dinner.

Association of Supervising Electrical Engineers.—Saturday, April 10th. Queen's Head Hotel, Maidstone. 3 p.m. "Compulsory Wiring Regulations and Registration." Mr. J. Munro.

Illuminating Engineering Society.—Tuesday, April 13th. Institution of Mechanical Engineers, London, S.W.1. 7.30 p.m. "Television Images—An Analysis of their Essential Qualities." Messrs. G. T. Winch and L. Jesty.

Diesel Engine Users' Association.—Wednesday, April 14th. Caxton Hall, London, S.W.1. 4.45 p.m. Informal discussion on Committee's report on "Development of the Diesel Engine During 1936."

Institution of Civil Engineers.—Thursday, April 15th. Institution, London, S.W.1. 6 p.m. "The Boulder Dam." Mr. J. L. Savage.

Junior Institution of Engineers.—Friday, April 16th. 39, Victoria Street, London, S.W.1. 7.30 p.m. Informal meeting. "A Historical Review of Mine Lighting." Mr. J. G. Garrett.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, April 17th. Cardiff. "Filing Engineering Data." Mr. T. F. Matthews.

Notes

A History of the Institution

The Council of the Institution of Electrical Engineers has given authority for a history of the Institution to be written, and Mr. Rollo Appleyard has undertaken to prepare the book. A great deal of relevant material is already in the archives of the Institution, but there must be many members of the Institution and others who have in their possession information, or can recall facts, which might be of assistance to Mr. Appleyard in making the work as complete as possible. Those who have such information are requested to write to Mr. Appleyard at the office of the Institution, Savoy Place, London, W.C.2.

Safety in Mines

A reference book entitled "Coal Mines Act, 1911: Regulations and Orders relating to Safety and Health," has been issued by the Mines Department (Stationery Office, 1s. 6d.). In this the Regulations of a general nature in force on January 1st, 1937, are collected in convenient form for the use of mine officials and mining students. The book also contains lists of certain types of apparatus for which statutory approval is necessary, namely, safety lamps, bulbs for electric safety lamps, other electric lighting apparatus and glasses for flame safety lamps; firedamp detectors; electrical shot-firing apparatus; breathing apparatus and smoke helmets. Lists also are given of permitted explosives and blasting cartridges and of types of electric signalling and telephone apparatus which have been certified for intrinsic safety.

The Women's Conference

Between four and five hundred delegates arrived at Bristol on Wednesday from all parts of Great Britain to attend the twelfth annual conference of the Electrical Association for Women. A report of the proceedings will appear in our next week's issue.

An E.P.E.A. Dinner

Last Saturday at the St. Ermin's Hotel, Westminster, S.W.1, the London Western Section of the Electrical Power Engineers' Association held its seventeenth annual dinner and reunion. Following the loyal toast, proposed by the chairman, Mr. A. Ardern, Mr. H. P. Gaze proposed "The Association," which, he said, now had 5,800 members, indicating that the great majority of staffs were supporting it. Mr. P. S. Jolin, the vice-president, responded. There was a tendency, he said, to forget the sales and consumers' section, which was coming increasingly to the fore. Efforts were being made to employ technical men in this sphere. For the future the progress of the McGowan Committee's recommendations was being followed closely. Mr. J. D. Midforth proposed the toast of "Our Section and Our Chairman," response being made by Mr. Ardern, who thanked the various officers for their work during the year. A programme of entertainment was arranged, as in previous years, by Mr. Cornet.

The E.I.B.A. in Sussex

The Sussex Centre of the Electrical Industries Benevolent Association is holding its fourth annual dance on April 23rd at the Grand Hotel, Brighton. Tickets (10s. single, 15s. double), can be obtained from Mr. B. S. H. Warde, hon. organising secretary (Cryselco, Ltd.), 59, Ship Street, Brighton.

Appointments Vacant

Lady demonstrator for North West Midlands J.E.A.

Two assistants, Grade II, for the Royal Aircraft Establishment, South Farnborough.

Technical officers and Assistants II for the Admiralty Technical Pools.

Lady demonstrator for Hastings Electricity Department.

Junior mains assistant and mains assistant for Darwen Electricity Department.

Two student trainees and lady demonstrators for Coventry Electricity Department.

Showrom manageress for West Bromwich Electricity Department.

Junior engineer for Peterborough Electricity Department.

Shift engineer, distribution assistant, and accountancy and statistical officer for Crewe Electricity Department.

Meter repairer for St. Helens Electricity Department.

First technical assistant for Bromley Electricity Department.

Designer and draughtsman at the Royal Aircraft Establishment, South Farnborough.

Two clerical assistants for Walthamstow electricity undertaking.

(See our classified advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

Motor-driven pasting machine for battery plates.

Perwis small bulkhead fittings for yachts.

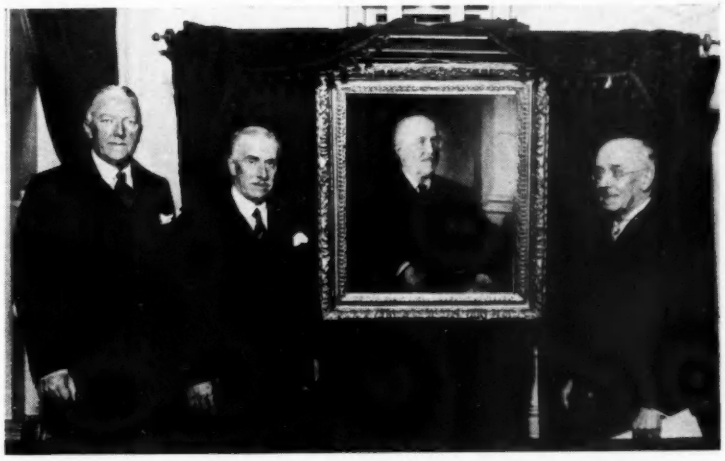
Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Col. Sir Thomas F. Purves, O.B.E., was elected president of the Batti-Wallahs' Society for the ensuing year at the annual general meeting held on March 23rd, and **Mr. M. Whitgift** was re-elected secretary and treasurer.

An interesting ceremony took place in Liverpool on April 2nd when, at the annual meeting of British Insulated Cables, Ltd., the shareholders presented for the custody of the board a portrait of **Mr. G. H. Nisbett,** M.Eng., the managing director of the company, painted by Sir William Llewellyn, President of the Royal Academy. In accepting the portrait Sir Alexander Roger (chairman) spoke of Mr. Nisbett's outstanding services to the company during the last forty-three years, and more particularly in its successful developments in recent years. It was through his initiative that British Copper Refiners, Ltd., was established at Prescot. Mr. Nisbett has taken an active part in the inception and working of the Cable Makers' Association, and his influence in cable design has been widely felt, while in the development of the high-voltage transmission of electricity he has taken a conspicuous share. He has closely identified himself with the various schemes for the welfare of the company's employés. Mr. Nisbett is chairman of seven electricity supply companies, a director of several cable and copper companies, and is a J.P. of the County of Lancaster.



The presentation of the portrait of Mr. G. H. Nisbett (managing director) to the company by B.I. shareholders, showing (left to right), Sir Alexander Roger (chairman), Mr. J. McKay (representing the shareholders), and Mr. Nisbett

Mr. A. E. Jack, of Gloucester, has been appointed senior charge engineer with the Chesterfield Electricity Department at a salary of £325 per annum. He succeeds Mr. G. H. Davies, who has retired owing to ill health.

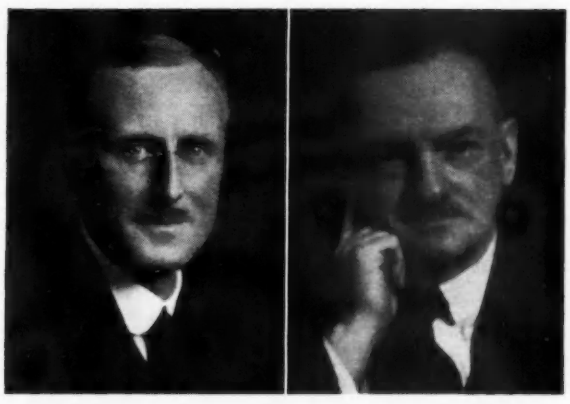
Mr. A. B. Randall, M.I.E.E., who has just retired from the position of engineer and manager of the Salisbury Electric Light and Supply Co., Ltd., was presented by the staff on March 31st with three oil paintings of scenes in the New Forest. Mr. Randall received his early technical training at University College, London, and was a pupil with Cromptons from 1891-94. He subsequently held posts with the Southampton Electric Light Co., Charing Cross and Strand Electricity Supply Co., and Callender's Cable and Construction Co., being appointed engineer and manager to the Salisbury undertaking in 1900. In that year the electricity generated was 125,322 kWh, and Mr. Randall has witnessed its growth to over 10 million kWh in 1936. Mr. Randall was also engineer and manager of the Wilton Co. from its inception in 1928 and managing director of the Tisbury Electric Supply Co. from 1921-1936. **Mr. R. A. McCulloch,** A.M.I.E.E., who has been deputy engineer for eighteen months, has been appointed to succeed Mr. Randall. Mr. McCulloch received his technical training at University College, Cardiff, and subsequently held positions with the South Wales Power Co., the West Wilts Electric Supply Co., and the Wessex Electricity Co.

Mr. A. B. Randall **Mr. R. A. McCulloch**

Mr. T. M. Climie, electrical engineer to the Falkirk Corporation, has been elected president of the Scottish Area Committee of the British Electrical Development Association, and **Mr. H. C. Babb,** general manager, has been appointed vice-chairman.

Lt.-Colonel S. E. Monkhouse, M.I.E.E., has been appointed general manager of the North-Eastern Electric Supply Co., Ltd., in succession to the late Mr. H. A. Couves, and **Lt.-Colonel E. H. E. Woodward,** M.C., T.D., B.Sc., M.I.E.E., has been appointed assistant general manager.

Colonel Monkhouse joined the North-Eastern Electric Supply Co., Ltd. (then known as the Newcastle-upon-Tyne Electric Supply Co., Ltd.), in 1904, and with the exception of war service, 1914-1919, has remained in the company's employ ever since, having served in various departments. In 1926 he was appointed head of the Power Department, and in 1929 became chief assistant to the general manager, being appointed assistant general manager on January 1st, 1931. In 1913 he received a Territorial commission in the Tyne Electrical Engineers, R.E., being mobilised in August, 1914. Early in 1917, when he held the rank of captain, he was seconded for employment in the Regular Army. Later, he was given the rank of brevet-major in the King's Birthday Honours by way of recognition of valuable services in connection with the employment of searchlights and sound locators for air defence purposes. In January, 1918, he was promoted lt.-colonel, being demobilised with that rank on the conclusion of hostilities, and subsequently posted to the Territorial Reserve of Officers. Colonel Monkhouse was one of the originators of the Tyneside Industrial Development Conference and has been very active in similar undertakings ever since. For a number of years he was chairman of the Industrial Heating Committee of E.D.A., and he is a member of the Council of the Incorporated Association of Electric Power Companies as well as being one of the employers' representatives on the No. 1 District Joint Council and Joint Board of the Electricity Supply Industry. He is a member of the North-East Coast Institution of Engineers and Shipbuilders, besides being chairman of the Northern Counties Area Committee of the Electrical Industries Benevolent Association.



Lt.-Col. E. H. E. Woodward **Lt.-Col. S. E. Monkhouse**

Colonel Woodward joined the North-Eastern Co. in September, 1909, in the Operation Department, and has subsequently held positions in the Statistical Department and Power Department and on the general manager's staff. He saw active service during the war and was awarded the Military Cross. At the end of the war he left the company's service and was employed on engineering agencies in South Wales and Bristol, rejoining the company in March, 1920. He holds a joint patent with Mr. W. A. Carne for electric water-heaters, and is also the joint author with Mr. Carne of a paper entitled "An Analysis of the Costs of Electricity Supply and its application in relation to various types of Consumers," which was read before the I.E.E. in 1932; this paper was awarded a special premium. Colonel Woodward is a member of various committees of the Incorporated Association of Electric Power

Companies and is a member of the Joint Committee of the Central Electricity Board and various associations on costs of production. He received the Territorial Decoration in 1931 and became brevet lt.-colonel in 1933.

Mr. W. R. Hunt, manager of the Birmingham branch of Falk, Stadelmann & Co., Ltd., has retired after forty-two years' service. He had been manager of the Birmingham branch since its inception. Mr. Hunt is succeeded by **Mr. H. G. Allen,** from the company's Dublin branch.

Mr. G. K. Paton, M.I.E.E., has been elected chairman of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers for the session 1937-8.

Mr. F. S. Naylor

Mr. F. S. Naylor has been appointed chief electrical engineer to Messrs. Firth-Browns, Ltd., Sheffield, whose works consume nearly 100,000,000 kWh per annum. Mr. Naylor is at present technical assistant and personal assistant to Mr. J. R. Struthers, general manager and engineer to the Sheffield Corporation electricity undertaking. He has contributed to the Electrical Review, and in our issue of September 27th, 1935, we published an article by him on "Diversity Factor."

The Aberdeen Electricity Committee has unanimously recommended that the post of city electrical engineer, which became vacant last summer, should be offered to **Mr. Alexander Gardner,** development and sub-station engineer at the electricity works. The salary suggested is £950, rising by annual increments of £50 to £1,050. As our readers are aware, there has been some discussion between the A.M.E.E. and E.P.E.A. on one side and the Town Council on the other regarding the salary to be attached to the post. In May, 1936, the Committee recommended that Mr. W. Hodson, the assistant engineer, should be appointed to the post at a commencing salary of £900, but he declined it on the ground that he understood that it would be £950, rising by £50 a year to £1,050. Subsequently it was decided to advertise the post at a salary of £900, rising by £50 a year to £1,050; but the two associations declared that the salary offered was inadequate and urged engineers not to apply for the post on these conditions. Nineteen applications were received, but the Committee decided that none of the applicants was suitable for the post and the position was readvertised. This time applicants were asked to state the salary required, and thirty-one applications were received. Mr. Gardner, who has been recommended for the appointment, graduated B.Sc. with second-class honours at Manchester University, and subsequently served in the Burnley Corporation electricity works. He has also held posts at Ashton-under-Lyne and with the Lancashire Dynamo & Motor Co. For the past twenty-five years he has been with the Aberdeen Corporation Electricity Department.

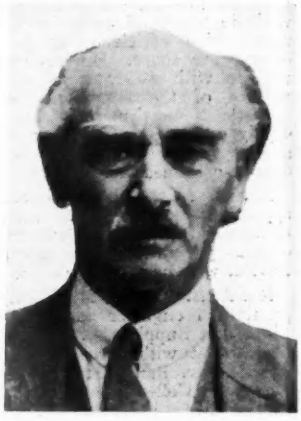
Mr. W. J. Jones, manager of the Lighting Service Bureau, sailed on the *Queen Mary* on March 31st for an extensive tour of America and Canada. Mr. Jones does not expect to return to this country until after the Coronation.

The address of Mr. F. C. Horsford whose removal was announced in our last issue is "Mul Va," Priory Hill Avenue, Sudbury, Middx., and his telephone number is Arnold 4426 *not* Arnold 1464 as stated.

Obituary

Mr. E. W. Hudson.—The death occurred on March 30th at the age of fifty-eight of Mr. Ernest Walter Hudson, who was appointed solicitor to the Electricity Commission shortly after its inception in 1919. He also advised the Ministry of Transport in matters concerning electricity. He retired from these positions in 1934 owing to ill-health.

Mr. Augustine Davy, M.I.E.E., managing director of the Weston Electrical Instrument Co., Ltd., Surbiton, whose death we recently announced, spent part of his early life as a marine engineer, largely in the Near East. Later he went to America, where he designed and constructed an electric power plant on Staten Island. Mr. Davy's association with the Weston Company extended over nearly thirty-five years. The first two years of this period were spent with the American Weston Co. as an electrical engineer immediately under the late Dr. Weston. For the last thirty-three years of his life Mr. Davy was in charge of the British Weston Co. During the war he served in a technical advisory capacity. He was sixty-two.



The late Mr. A. Davy

Mr. J. Stirrup, consumers' engineer, Liverpool Electric Supply Department, collapsed and died in Dale Street, Liverpool, a few minutes after leaving the Electricity Offices in Hatton Garden on March 31st. Mr. Stirrup was sixty-four years of age, and in May last, in recognition of his fifty years' service in the Liverpool Corporation electricity service, he was presented by his colleagues with three water-colour pictures.

Sir John Brooke

THE electrical industry has suffered a severe loss through the death of Sir John Reeve Brooke, C.B., deputy-chairman of the Electricity Commission. To Sir John Snell, the chairman, the loss of one who has for so long carried very large responsibilities as his deputy, will come as a particularly heavy blow personally, while to all of his colleagues, as well as to the staff, the death of a chief of such wide experience at a time when so much of importance is pending and in prospect under the McGowan policy, must be a matter of deep regret and even concern.

Sir John, who had been ill for several weeks, recently underwent an operation in a London nursing home, but we understand that little hope of recovery was entertained for some days before his death. He was only fifty-six years of age.

In recent years, in addition to the manifold duties attaching to his office, he had attended and spoken at a very large number of electrical functions. In the normal course of things he seemed destined to play an even more prominent part than he had already done in electricity supply matters during the coming decade.

Born in 1880, son of Mr. J. R. Brooke, of Lincoln's Inn, he was educated at Haileybury and Corpus Christi College, Oxford, and in 1912 entered the Civil Service as a private secretary. During the war he saw service in France and also worked at the Food Ministry. In 1920 he married Dorothy, the youngest daughter of Sir Horace Lamb, F.R.S.

[*Bassano*

The late Sir John Brooke

While filling the post of Secretary to the Ministry of Transport his duties included attendance at the meetings of the Weir Committee and work connected with the Ministry's introduction into Parliament of the Bill which ultimately became the Electricity (Supply) Act, 1926, which provided for the creation of the Central Electricity Board. He was secretary of the Central Board from its formation until he resigned the office in order to become an Electricity Commissioner in March, 1929. He was appointed vice-chairman of the Commission on the retirement of Sir Harry Haward in March, 1930. He received his knighthood in 1928.

The remains were cremated at Golders Green on Monday last, April 5th.

The family mourners included Lady Brooke (widow), Miss Brooke (sister), Prof. and Mrs. E. H. Lamb. There was a large gathering of representatives of the Electricity Commission, the Central Board, professional and trade organisations, and others, among them being Lord Rutherford, Sir Archibald Page, Sir Ralph Wedgwood, Sir James Devonshire, Sir Leonard Pearce, and Messrs. J. M. Kennedy (representing Sir John Snell), F. A. Cortez-Leigh, H. Hobson, F. Hodges, R. T. G. French, R. H. Fox, W. W. Lackie, C. G. Morley New, J. M. Donaldson, R. W. Rawlings, H. T. Young, V. Watlington, H. W. Couzens, J. W. Simpson, and A. C. Cramb.

A memorial service, held at St. Clement Danes Church, Strand, on Wednesday last, was attended by a large number of prominent electrical men.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Brodrick Engineering Co., Ltd.—Private company. Registered March 31st. Capital, £1,000. Objects: To carry on the business of manufacturers, importers, exporters or assemblers of and dealers in radio, radio products, radio apparatus, &c. The first director is T. W. Gates, 55, St. James' Road, S.W.17.

Frank Riddiough & Son, Ltd.—Private company. Registered April 1st. Capital, £15,000. Objects: To acquire the business now carried on at 10, Lee Street, Thornton Road, Bradford, as "Frank Riddiough & Son," and to carry on the business of radio and electrical wholesale factors and dealers, &c. The directors are: L. Frankland, 74, Holly Bank Road, Bradford, A. Laverack, Wynn Garth, Belmont Avenue, Baildon, and J. W. Riddiough, Ferncliffe Drive, Baildon. Secretary: A. Laverack. Solicitors: Heap & Heap, Royal Chambers, Upper Piccadilly, Bradford.

M.E.E., Ltd.—Private company. Registered March 25th. Capital, £12,500. Objects: To carry on the business of manufacturers and suppliers of all kinds of electrical apparatus and machines for marine and other purposes. The subscribers are: L. Parsons, "Fortrose," Maidstone Road, Chatham, Kent, J. Ramsay, 7, Berridge Green, Edgware, Middlesex. Secretary: A. Sutherland. Solicitors: Trotter, Leaf & Pitcairn, 56, Victoria Street, S.W.1.

British Power Railway Signal Co., Ltd.—Private company. Registered March 30th. Nominal capital, £100. Objects: To carry on the business of manufacturers and installers and users of and dealers in signal appliances, &c. The subscribers are: G. A. R. Richardson and M. H. Heilbut, both of Kennan's House, Crown Court, Cheapside, E.C. Registered office: Caxton House, Westminster, S.W.1.

Sign Maintenance, Ltd.—Private company. Registered April 2nd. Capital, £1,000. Objects: To carry on business as electrical engineers and contractors for maintaining and repairing neon electrical and other signs, &c. The permanent directors are: L. M. Summers, 91, Hall Road, Pinner; J. I. Lewis, 23, Sherwood Road, N.W.4; and H. Joseph, 12, Sherwood Road, N.W.4.

Evans & Shea, Ltd.—Private company. Registered April 3rd. Capital, £500. Objects: To acquire the business of an electrical engineer and contractor now carried on by J. F. A. Evans at 4 and 6, Witney Chambers, Longbridge Road, Barking, as "Evans & Shea." The directors are: J. F. A. Evans and Mrs. B. J. Evans, both of 117, Ashburton Avenue, Ilford. Registered office: 4 and 6, Witney Chambers, Longbridge Road, Barking, Essex.

Duncan Mays, Ltd.—Private company. Registered April 3rd. Capital, £1,000. Objects: To carry on the business of electrical engineers, lighting specialists and contractors, wireless engineers, &c. The directors are: D. W. Mays, 30, Doyle Gardens, N.W.10; and J. W. Howe, 6, Hillside Road, Northwood, Middx.

A. C. Bendall & Co., Ltd.—Private company. Registered April 1st. Capital, £600. Objects: To carry on the business of electrical, mechanical and general engineers, manufacturers of and dealers in all kinds of machinery, tools, appliances and implements, &c. The subscribers are: E. D. Syson, 49, Queen Victoria Street, E.C.4 and L. C. Webster, 37, Bedford Road, East Finchley, N.2. Solicitors: Kennedy Lindo & Co., 49, Queen Victoria Street, E.C.4.

Bright's Refrigerator Service, Ltd.—Private company. Registered March 31st. Capital, £200. Objects: To carry on the business of dealers in and manufacturers of refrigerators, manufacturers of and dealers in all electrical apparatus, electrical contractors, &c. The directors are: C. B. Bright and G. Bright, both of 131, Hampstead Road, N.W.1. Registered office: 152, Commercial Street, Bishopsgate, E.1.

Ismay Cutting Tools, Ltd.—Private company. Registered April 2nd. Nominal capital, £5,000. Objects: To carry on the business of manufacturers and grinders of and dealers in hard alloy cutting tools, &c. The directors are: T. S. Cornwell, 31, Abbotswood Gardens, Ilford, Essex; and H. Reay, 24, Havering Drive, Marshalls Park, Romford.

Bulson Bros., Ltd.—Private company. Registered March 30th. Capital, £2,000. Objects: To acquire the business of radio and electrical engineers heretofore carried on by P. E. Bulson and G. R. Bulson at New Road and Park Lane, Chippenham, Wilts. The directors are: P. E. Bulson, 47, Dallas Road, Chippenham, and G. R. Bulson, "Branscombe," Malmesbury Road, Hardenhuish, Chippenham.

Returns of Electrical Companies

Dickinson Electrical Manufacturing Co., Ltd.—G. R. Webb, C.A., of 26, Wardrobe Chambers, 146a, Queen Victoria Street, E.C., was appointed receiver and manager on March 22nd, 1937, under powers contained in debentures dated September 7th, 1920.

Dynameg, Ltd.—Satisfaction to the extent of £846 on December 31st, 1936, of debenture registered January 31st, 1934. (Notice filed March 24th, 1937.)

Nivalight (1928), Ltd.—Capital, £5,000 in £1 shares. Return dated December 23th, 1936. All shares taken up. £5,000 paid. Mortgages and charges at date of return, nil. Since registered: series of debentures for £2,500, all issued, February 16th, 1937, and series of debentures for £1,000, all issued, March 2nd, 1937.

Particulars filed of £1,500 debentures authorised March 22nd, 1937, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Shirebrook Electric Supply Co., Ltd.—Capital, £5,000 in £1 shares. Return dated November 4th, 1936. 4,800 shares taken up £4,162 10s. paid (£1 on 2,800 and 15s. on 2,000). £137 10s. calls unpaid. Mortgages and charges, nil.

Tungsram Electric Lamp Works (Great Britain), Ltd.—Capital, £100 in £1 shares. Return dated December 14th, 1936. 10 shares taken up. £10 paid. Mortgages and charges, nil.

Prangnell Partners, Ltd.—Capital, £1,000 in 1,000 shares of £1. Return dated December 8th, 1936. 962 shares taken up. £174 10s. paid (5s. on 650 ordinary and £1 on 12 ordinary shares). £300 considered as paid on 300 ordinary shares. Mortgages and charges, nil.

Robinson & Hands Electric Co., Ltd.—Capital, £5,000 in 20 ordinary and 4,980 preference shares of £1. Return dated October 19th, 1936. 20 ordinary and 4,232 preference shares taken up. £4,252 paid. Mortgages and charges, £3,000 debenture.

City Notes

British Insulated Cables, Ltd., held its annual meeting on April 2nd at Liverpool, when Sir Alexander Roger (chairman), who presided, said that the past year's trading established a record for the company both in sales and in volume of output. Under the fifty headings into which the various manufactures were divided for statistical purposes, forty-three showed record figures. The turnover increased by 32.5 per cent. over that of the previous year, and by 54.9 per cent. as compared with 1934. Last year he intimated that the board was investigating a form of rationalisation within the ambit of their own group of manufacturing companies. They had since purchased the undertakings and assets of the Macintosh Cable Co., Ltd., Derby, and the Croydon Cable Works, Ltd., and had decided to centralise and distribute manufacture at the Prescot and Helsby works. The buildings at Derby and Croydon had been sold and the best of the plant and machinery had been transferred to either Prescot or Helsby. Some extension of the buildings at Helsby had been necessary to house the plant taken over, and the opportunity had been taken to make provision for an increase in the manufacturing capacity, particularly in the direction of telephone switchboard cables, silk-covered wires, &c., as well as for an improved lay-out for a considerable proportion of the plant. The Prescot electricity undertaking was formally taken over by Liverpool Corporation on April 1st, 1936, and the electricity supply for the Prescot factory was now obtained from Liverpool. British Copper Refiners, Ltd., continued to make good progress, and during the past year had substantially increased its output. Their parent company absorbed about 20 per cent. of the copper of all kinds brought into this country and about 33 per cent. of the copper used for electrical purposes. International trade was improving, and although they were exceptionally busy at home, they had no intention of neglecting their overseas business. Three months ago, in conjunction with the Metropolitan-Vickers Co., and the English Electric Co., they completed the first section of railway electrification in Poland, which comprised 179 miles of single track, and in Brazil, again in conjunction with the Metropolitan-Vickers Co., they had in progress another contract for railway electrification extending to 112 miles of single-track overhead equipment. Their order books at present generally showed an improvement on the past year, and the works were operating to capacity. The advance in the prices of raw materials required heavy additional finance which would have represented a burden on them had they not built up their reserves over years for this and other purposes. The present excellent showing made by the profit and loss account had been arrived at largely by concentrated effort and by utilising the resources of the company in men and plant almost to the breaking point. A large proportion of the machinery had been working double shift throughout the year, and in some cases even 23 out of 24 hours. During the past year they had spent about £200,000 of capital, and the work now in hand or in contemplation would probably involve a similar amount this year, but they could not view the future with equanimity, and they were determined to guard against over-expansion of productive capacity.

At an extraordinary meeting which followed the annual meeting resolutions were passed increasing the ordinary capital from £1,666,666 to £2,000,000 by the creation of 333,334 ordinary £1 shares, undivided profits of the company to be utilised for the purchase price of the additional shares and such shares to be distributed *pro rata* amongst holders of ordinary stock in the proportion of one new ordinary share for each £5 of ordinary stock held.

Associated Electrical Industries, Ltd., held its annual meeting on April 2nd, when Sir Felix Pole (chairman), who presided, said that the report showed that all the company's works continued to be well employed during the year. Orders received during 1936, as well as orders in hand at December 31st, showed a substantial increase over those for 1935. All their companies were exceptionally busy, and the orders received so far this year were in excess of the total for the corresponding period of last year. As an indication that they had completely emerged from the slump conditions of a few years ago, he said that whereas the number of employés in all their companies fell to about 22,000, the latest total for the group was 37,838. They had every reason to anticipate good trade for at least another year or two. With regard to the activities of the Metropolitan-Vickers Electrical Co., in Poland, the Warsaw Junction electrification scheme, for which they were joint contractors, was nearing completion, and traffic on the electrified lines was started in December. In Brazil the electrification of portions of the suburban lines of the Central

Railway was progressing satisfactorily, and the first trains had undergone satisfactory running tests. They hoped this year to expedite the commencement of the second portion of this work. The Fulham power station for which they supplied two 60,000-kW turbo-alternator sets, switchgear, transformers, &c., was officially opened during the year. Apparatus in process of manufacture and erection included a 50,000-kW set operating at a steam pressure of 1,950 lb. for the Brimsdown power station of the North Metropolitan Electric Power Supply Co. The year was notable for the number of large turbo-alternators for which orders were received both at home and from overseas; also for orders for large electric winder equipments for use in the mines of South Africa and India. A further two 33,000-kW sets for the Victoria Falls and Transvaal Power Co., Ltd., were put in hand in 1936, while since the beginning of the current year further orders had been received for four similar sets, making twelve in all ordered by that company for the Klip River station, which was equipped entirely with their generating plant. An order had been received from the London Passenger Transport Board for fifty-two Metadyne regenerative control equipments. Much of the plant for which orders had been received was required to meet the growth of demand on the power stations of the grid system of the Central Electricity Board. For the Alexandra Palace they had manufactured and installed continuously evacuated short-wave valves for television transmission. There was every reason to hope that the consumption of electricity would continue to increase and there was a long way to go before approaching the saturation point. Notwithstanding the increase of orders in the home market their policy was to do everything possible to develop export business. They had received large orders from overseas, and Russia was again included in the countries represented. They had undertaken important munitions contracts, and they had placed their research facilities at the disposal of the Government. They had, however, safeguarded their capacity to execute home and export work by making certain extensions and improvements in the area and productive capacity of their manufacturing plants, thereby enabling them to carry out their ordinary work satisfactorily. They had a long list of buildings which they were floodlighting during the Coronation celebrations in London and many of the provincial towns and cities. In paying a tribute to the staff, Sir Felix said that on the occasion of the Coronation holiday they were making to all employés who were usually not paid at holiday times a bonus payment equal to the time rate for the normal working hours. The cost of this would be not less than £10,000.

The Clyde Valley Electrical Power Co.—Presiding at the annual meeting held on March 31st at Glasgow, Mr. C. Ker (chairman), said they had experienced yet another year of progress, but the expansion in business had involved considerable expenditure. Last year £417,000 was spent on capital account; £127,000 in connection with buildings and plant for the new 30,000-kW generating set at Yoker and £268,440 on substation buildings and equipment, mains, cables and meters. Owing to the space available at Yoker becoming insufficient to accommodate the distribution stores, further premises had been acquired and were now in occupancy. Subsequent to the Coatbridge and Airdrie districts being taken over in 1934 the number of consumers had risen from 2,067 to 6,231. Since the close of the year the Central Electricity Board had directed that a further 30,000-kW turbo-alternator and plant should be installed at Yoker at an estimated capital outlay of £330,000, to be ready for service towards the end of 1939. At the end of 1939 their installed plant capacity would be 73,500 kW at Clyde's Mill, 100,000 kW at Yoker and 15,520 kW at the hydro-electric stations of their subsidiary, the Lanarkshire Hydro-Electric Power Co. The sales of electricity during 1936 amounted to 377 million kWh, an increase of 58 million kWh over those of 1935, of which 50 million additional kWh went to power and bulk supplies and the remaining 8 million kWh to domestic users. The average rate per kWh received from consumers was 0.6427d., against 0.6773d. in the preceding year, and the combined average rate of the parent company and its subsidiary, the Strathclyde Electricity Supply Co., was 0.7247d., as compared with 0.7685d. in 1935. These figures excluded amounts received from the Central Board for supplies exported to the grid. New consumers connected during the year, including those of their subsidiary, reached 17,112, bringing the total number to 129,356. Connections added to the system increased by 34,372 h.p., making the total 455,821 h.p. The cost of coal per ton was higher than in 1935 and the continued increases had been such that they had made representations to the Government. In referring to the Central Board Mr. Ker emphasised the unfairness of the provisions of the Act of 1926 as regarded the prices to be paid by the Board to selected station owners and pointed out that the Board was taking electricity from them at a price that not only gave nothing for the overhead charges, but did not even pay in full for the cost of the coal used in the production of the energy exported to the Board. The position of their subsidiaries, the Strathclyde Co., the Lanarkshire Hydro-Electric Co., and the Clyde Valley Accessories, Ltd., was satisfactory. The directors were promoting a Provisional Order seeking, through Parliament, powers to increase the capital, when the question of the imposition of any restrictions on their powers could be properly raised.

The Midland Electric Corporation for Power Distribution reports an increase in revenue during 1936 of £69,322 to £535,767. The net profit is £124,111 (£105,392), which with £36,243 brought in and £3,028 other income makes £163,382. A sum of £20,000 is allocated to reserve (same), and it is proposed to pay a final ordinary dividend of 6 per cent., making 9 per cent. for the year, against 8 per cent. for 1935, leaving £44,262 to be carried forward. Presiding at the annual meeting on April 2nd, Mr. G. H. Nisbett (chairman) said that sales of electricity had increased by 19.5 per cent., and as regarded revenue by 15.1 per cent. only. This was due to the further reduction in all charges of 2½ per cent. as from January 1st, 1936; to an improved load factor by industrial consumers; and to an extension of the use of the two-part tariff by domestic consumers. The average price obtained for all sales was 0.85d. per kWh. Capital expenditure had increased by nearly £237,000. Hire purchase installations to the value of £26,000 were carried out, and the change-over scheme at Wednesbury had been completed. During the year 19,316 kW was connected (a record) of which 16,000 kW was for industrial power. Annealing furnaces were installed by five consumers, and applications were on hand for further furnaces, including some for melting purposes. Their industrial charge under the two-part tariff was £3 17s. 6d. per kVA per annum, plus 0.194d. per kWh used; under this rate furnaces were operating at an all-in charge of 0.35d. per kWh. With regard to the domestic load 3,300 kW was connected during the year, and all charges for supply were reduced. The highest rate charged to quarterly consumers was 3.68d. per kWh for flat rate lighting, and this was charged throughout the rural area. On the two-part domestic tariff the kWh charge was only just above ½d. In referring to the McGowan Report, Mr. Nisbett said that its recommendations were not likely to have any appreciable effect on their company, many of the essential features of the Committee's scheme being already in line with their current practice. New offices being erected adjoining the distribution headquarters at Tipton were to be opened in June.

The Automatic Telephone & Electric Co., Ltd., held its annual meeting on April 5th, when Sir Alexander Roger (chairman), who presided, said that of their subsidiary companies the most important now was Telephone & General Trust, Ltd., which had again issued a satisfactory report. Elexcel, Ltd., another wholly owned subsidiary, had done much in the past year in developing its sales organisation and extending its contacts in the electrical distributing trade. With regard to the telephone service in this country, the "on demand" trunk service in many parts of the country was being developed as quickly as possible, and the automatisation of rural areas was making steady progress, in all of which the company was taking an active interest. The Strowger automatic telephone switch mechanism had been adopted in exchanges in this country, India, South Africa, Australia, Portugal, and the Baltic States. They were also meeting an increasing demand for private telephone installations in offices, factories and elsewhere. With regard to overseas business, in October last they completed the entire telephone network of Kaunas, Lithuania. In Johannesburg the opening of several new exchanges and extensions to other exchanges was followed by the construction of a new trunk exchange. Their trunk switchboard represented the latest development in toll and long-distance technique, and utilised their new Strowger switch. Their equipment was adopted for the automatic network of Durban so as to secure the same system as standardised by the Union of South Africa. Australia had commenced extending its telephone service, and in New Zealand and other countries the prospects of business for the company were improving. Their miscellaneous business now represented 20 per cent. of their total turnover, and included Strowger switching systems for street lighting control, totalisators, mine signalling equipment, train describer equipment, street traffic control, power network remote control, and other lines. In order to stimulate further efforts of their staff they were engaged in working out a profit-sharing scheme.

Cable and Wireless (Holding), Ltd.—The court of directors has approved for submission to the stockholders a scheme of capital reconstruction the effect of which may be summarised as follows:—That the 1¾ years' arrears of dividend on the 5½ per cent. cumulative preference stock to December 31st, 1936, which will remain after payment out of the profits for 1936 of one year's dividend in cash shall be cancelled in consideration of the issue to the preference stockholders of 4 per cent. cumulative funded income stock to be created to a nominal amount equal to the net amount of the arrears after deducting income tax at 4s. 9d. in the £. That the capital shall be reduced by writing down the issued amount of the "A" and "B" ordinary stocks to a total of £6,883,092, and amalgamating those stocks into one class of ordinary stock to be held as follows:—Each holder of "A" ordinary stock to hold £30 nominal of ordinary stock in the reorganised capital in respect of each £100 nominal of "A" ordinary stock now held; each holder of "B" ordinary stock to hold £7 10s. nominal of ordinary stock in the reorganised capital in respect of each £100 nominal of "B" ordinary stock now held. The 4 per cent. cumulative funded income stock will, as regards both capital and interest, be payable only out of profits (except in a winding-up) and will rank for interest at the rate of 4 per cent. per annum and repayment of capital on a winding-up, in priority to the preference and ordinary stocks, and will be redeemable by a cumulative sinking fund of 1 per cent. (payable out of profits only) in priority to the payment of any dividends on share capital. Except for the creation of this funded income stock and its issue to the preference stockholders in satisfaction of 1¾ years' arrears of dividend, the rights attached to the preference stock are not to be altered in any way. The proposals will be submitted at an extraordinary meeting to be held on May 24th.

A Reyrolle & Co., Ltd., report a profit for 1936, after providing for depreciation of buildings and plant, including interest received on investments and loans, of £130,743 as compared with £114,336 in the preceding year, less £1,000 voted at the last meeting to local charitable and other funds. The final ordinary dividend is 7½ per cent., again making 12½ per cent. for the year, £40,000 is transferred to provision for development expenditure, and £128,336 is carried forward. The report states that the value of orders received and the sales of the company's products were greater than in any previous year, and there was a large increase in the amount of uncompleted work in hand. The increasing volume of work has made it necessary to put in hand extensions to the company's factories and equipment, some of which are now in progress. To meet the cost of these additions it is proposed to issue further capital, and a resolution was to be submitted at the annual meeting yesterday (Thursday) that the capital should be increased to £1,000,000 by the creation of 300,000 additional shares of £1 each. Of these 195,000 ordinary shares will be allotted to ordinary shareholders in the proportion of one new share for every three shares held at 25s. per share. Another resolution was that £1,500 should be set aside out of the profits of the year for distribution among local charitable and other funds.

The Telephone & General Trust, Ltd., held its annual meeting on March 31st when Sir Alexander Roger (chairman), who presided, said that the proportion of investments and loans in Great Britain and the Empire amounted to 58.12 per cent. as against 47 per cent. a year before, the foreign investments and loans being 41.88 per cent. as against 52 per cent. The subsidiary companies had again all earned profits. They had been urging forward the provision of a complete system of telephony and radio telephony in the British West Indies, and they now held substantial interests in the telephone business in Jamaica, Trinidad and Barbados, in addition to their large interest in Venezuela. In Jamaica they had completed the installation of automatic telephones in the area which they administered. With regard to Trinidad, the franchise of that company expired in 1939, and active negotiations were taking place with the Government for an extension, given which they could see an opportunity of spending at once probably £100,000 on extending and improving the service. They were carrying out their policy of installing the latest form of Strowger automatic telephones in Barbados, and this system would be completed in the autumn of this year. In the companies in which they were interested in the West Indies the total capital involved was approximately £485,000, and there was the prospect of the expenditure of a further £500,000 which could be undertaken. The Nacional Co. in Venezuela reduced its tariffs on January 1st last, and it had now recovered nearly all of the telephone subscribers lost during the years of depression. The question of a measured or category tariff was under negotiation.

The British Aluminium Co., Ltd., held its annual meeting on March 31st last, when Mr. R. W. Cooper (chairman), who presided, said that in 1936 trading results were much better than in the previous year and they disposed of a larger tonnage of aluminium. Competition was not so severe and prices generally remained constant. During the latter part of the year they commenced restarting idle plant, and all such plant was brought into operation early this year. They were extending plant and buildings at Lochaber and providing equipment for the production of additional supplies of alumina and carbon electrodes. When this work was completed the output capacity of aluminium at the Lochaber works would be doubled. The use of aluminium in the electrical industry continued to expand, and they had supplied a large quantity of bus-bars for use at a British film studio. The adoption of bare aluminium conductors for interior distribution in large buildings was another development in this country. Good progress had also been made in the use of aluminium for reflectors. They commenced the current year with a satisfactory order book and the outlook was distinctly favourable. An extraordinary general meeting followed, at which a resolution was carried increasing the capital of the company to £7,000,000 by the creation of 2,500,000 additional ordinary shares of £1 each. The new capital is required to finance the further extensions being made at Lochaber.

The Watford Electric & Manufacturing Co., Ltd.—Presiding at the first annual meeting held on April 1st Mr. H. Coates said that for the present year the value of orders received up to March 31st was 77 per cent. over the value of orders received during the corresponding period of last year, but this was in excess of their present manufacturing capacity. They had therefore put in hand a considerable extension at the latter end of last year, adding 18,000 sq. ft. to the present 27,000 sq. ft. of floor space, and this was so well advanced that they anticipated this extension being used about the end of May. This involved an expenditure of approximately £12,000, in addition to which the growth of orders had involved them in the necessity of providing working capital to finance their purchase of raw materials and increased wages bill, and it was proposed, therefore, to circulate all shareholders forthwith regarding the issue of the remaining unissued shares. These shares would be offered to the existing holders in the proportion approximately of one new preference share for every four preference shares now held, and one new ordinary share for every nine ordinary shares now held. The issue would be 50,000 ordinary shares of 2s. each at 4s. per share and 20,000 preference shares of 10s. each at par.

Ericsson Telephones, Ltd., held its annual meeting on April 2nd last, when Col. Sir Harold A. Wernher (chairman), who presided, said that in 1936 they had employed the largest number of people in their history, and they now directly employed 4,000 persons. Sales were considerably higher than in 1935, and the orders on hand had created a record, as also did the net profit. In all branches trading was satisfactory and several propositions were under consideration which might be added to broaden the basis of their trading structure. To meet increased turnover the machinery at the factory had been considerably augmented and reorganised. The Coronation had added to the need for telephone equipment, and they had been entrusted with a share of this work. Satisfactory expansion had also been experienced in their export trade. The position of their totalisator subsidiary was good, but later, when this associated company had served its purpose, and with a view to economy, they proposed to absorb its business into their own. During the year they completed and equipped a new laboratory; the value of research work was becoming increasingly important. They were moving from their existing offices towards the end of this year to a new building in Lincoln's Inn, which would enable the staff to be housed under modern conditions.

Companies Struck Off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—Aurolite Electrical Supplies, Ltd.; Electrical Devices, Ltd.; Empson Electrical Engineering Co., Ltd.; Highfield Electrical Co., Ltd.; Mall Radio and Electric, Ltd.; Maybrook Electrical Co., Ltd.; Radio Company of Great Britain, Ltd.; Wessex Electrical Supplies, Ltd.

Stothert and Pitt are to issue the balance of 58,415 ordinary shares of £1 and to offer them to existing ordinary shareholders at 28s. each in the proportion of one for every four now held with the right to apply for excess shares. The new shares will rank for dividend *pari passu* with the existing ordinary shares as from July 1st, 1936.

The Marconi International Marine Communication Co., Ltd., reports net profits for 1936 of £116,842, as compared with £90,118 in the preceding year, to which is added £13,914 brought in, making £130,756. The final dividend is 5 per cent., maintaining the distribution for the year at 7½ per cent. and £12,308 is carried forward. Meeting: April 16th.

The Southern Areas Electric Corporation, Ltd., reports that dividends receivable from all subsidiary companies for 1936 aggregated £33,038 (against £23,840 for 1935). It is proposed to pay a dividend for the year of 4½ per cent. (against 4 per cent.), of which 1½ per cent. interim was paid on the old ordinary shares on November 30th. The final dividend will be paid on both the old and the new ordinary shares.

The Morgan Crucible Co. reports a net profit for 1936 of £417,892, as against £368,421 in the preceding year. The final dividend on the ordinary stock is 1s. per £1 of stock, making 1s. 6d. for the year (against 1s. 4½d.), and £134,875 is to be applied to the capitalisation of 5 per cent. obligations to be retained for employment in the business.

Heatrae, Ltd., reports a net profit of £9,491 for the year ended February 28th. The pre-incorporation profits amounting to £1,596 have been utilised in writing down the goodwill account. The ordinary dividend is 10 per cent., and £1,664 is carried forward.

The Anglo-Portuguese Telephone Co. is paying a final dividend of 5 per cent. on the 1,013,750 ordinary stock, making 8 per cent. for the year (same). A dividend of 8 per cent. has also been declared on the "A" ordinary shares (unchanged).

Franco Signs, Ltd., is paying a final dividend of 6d. per share, making a total for the period May 8th, 1936, to March 31st at the rate of 10 per cent. per annum.

The Oriental Telephone and Electric Co. is paying a final ordinary dividend of 8 per cent., making 12 per cent. for the year (same).

Stocks and Shares

Tuesday Evening.

JUDGED from the present condition of business in most of the Stock Exchange markets, it might be almost thought that the effects of the Easter holidays had scarcely worn off. The prevailing quietude may be ascribed with greater accuracy, perhaps, to the imminence of the Budget date and to the political developments which are occurring day by day in the United States as well as in France. Money stocks are showing a good deal of resistance to the tendency of dullness prevailing in other parts of the House. There are few features in the lists of companies connected with the electrical world. Publication of the Cable and Wireless plan of reorganisation led to a rise in the price of the preference stock and to falls in the two ordinary stocks of the combine.

Cable and Wireless

The market gave a mixed reception to news of the capital reorganisation scheme outlined for the Cable and Wireless Company. Some such scheme has, of course, been anticipated for several months. Most people were prepared for the proposals to take drastic shape. While, however, the preference stock will obviously come out well under the suggested scheme, surprise has been expressed at the treatment in store for the two ordinary stocks. Few complaints are expected from preference stockholders. The scheme gives full recognition to dividend arrears, and calls for no revaluation of capital. The dividend is evidently being covered, with something to spare, by current earnings. The trend of recent traffic-indices indicates a widening of the safety margin. Satisfaction with the preference position found expression in a rise of 2 points, to 114, in the price of the stock.

The Ordinary Stocks

The position of Cable and Wireless ordinary stocks under the reorganisation scheme is clearly less happy than that of the senior issue. The principle of writing down, and then amalgamating, the two classes of ordinary stock, is generally approved: the severity of the proposed capital cut has, however, already aroused such criticism as to suggest that the scheme will not be carried through without protest from those stockholders who are asked to bear the brunt of the reduction. Apprehension is reflected in lower prices for both stocks. The "A," which before the announcement was standing at just under 30, fell to 28 before rallying to 29. The "B" dropped to 7, as against 9 previously. Recovery lifted it to 7⅞. Under the new conditions, the nominal value of the "A" would be 30, and that of the "B" 7½. There is a disposition in the market to suspend judgment until publication of fuller details, and of the annual report. The latter, due next month, should afford a rough guide to the prospects of the new single ordinary stock.

New Issues Routine

A short paragraph or two dealing with Stock Exchange practice in regard to new issues may serve to answer questions which, experience finds, presents occasional difficulties to many people. In the first place, it can be stated that dealings in new issues, either by way of allotment letters or letters of renunciation, are generally settled for cash. The bargains are not for the ordinary Stock Exchange settlement; they are done, unless otherwise stated, for settlement when the allotments or renunciations are delivered. This applies equally,

of course, to sellers and to buyers. Another point worth noting by sellers of new issues is that a form is usually provided, on the back of such letters, for the buyer and the seller to sign. When an order is sent to sell such shares, the client can save both time and trouble by signing the renunciation form—filling in no details—across a penny or a sixpenny stamp, according to the instructions on the form.

"Rights"

A third matter deserving of emphasis is that on no account should an offer of new shares by an existing company be disregarded. More often than not, the rights are of value. Yet it happens every day that people throw away such rights as being no more than circulars. Reference to a Stock Exchange broker should always be made in order to find out whether a premium is quoted on the shares. Elementary as these points may appear to those people who are in touch with Stock Exchange affairs, it is very certain that they are but imperfectly understood by many other investors, to whom their clearer comprehension would frequently save uncertainty, loss of time and neglect of profit. Within the past two or three weeks, several new issues, conferring rights, have been made by electrical companies. In nearly every instance the rights have been saleable at a useful premium if the shareholder receiving them did not wish to take up his proportion at the bonus price.

Electricity Supply Market

The past week has seen a further stiffening of confidence in the market for home electricity supply issues. The recovery in prices which began towards the end of last month has taken another step forward. The advance is all the sounder for having taken place with little encouragement from factors extraneous to the market itself. British Power and Light shares have been in steady demand since publication of the report; the price, now 28s. 9d., affords a yield on the 6 per cent. dividend of approximately four guineas per cent. Lancashire Electric ordinary and 7 per cent. preference are quoted ex-rights to the new ordinary shares, which, offered at 27s. 6d., are changing hands at around 6s. 6d. premium. The old ordinary shares stand at 34s., and the preference at 35s. 6d. West Gloucester Power stock, also quoted ex-rights, recovered the whole of a drop from 112 to 108. Midland Counties ordinary are 1s. 6d. up at 40s.; the premium on the new 4¼ per cent. preference, issued at 20s. 6d., has hardened to 1s. 3d. A number of share prices show gains of 1s. or more. Among them are Yorkshire Electric, Metropolitans, County of London and Southern Areas. The last mentioned rose from 21s. 9d. to 23s. 3d. on the higher dividend declaration. Isle of Thanet are dull at 21s. 3d. ex-dividend.

Manufacturing and Equipment Shares

Electrical equipment shares reflect the rather listless air of industrial markets as a whole. The process of adjusting prices to a level more in keeping with the lowered gilt-edged standard seems to have run its course; there is as yet, however, no particular sign of any disposition towards an advance from the new basis. Reports of annual meetings, held within the past few days by Associated Electrical Industries, British Insulated Cables and Ericsson Telephones, produced little response in the price of the respective shares, although in each case the proceedings gave ground for optimism. Associated Electrical, at 51s. ex-dividend, have recovered the dividend deduction. Allowing for deduction of rights, Lancashire Dynamos, at 3 7/16, are about ½ down on the week; the new shares, offered at 6l s., stand at 7s. 6d. premium. Switchgear and Cowans new shares have a premium of 1s. 3d. over the issue price of 16s. The old are 17s. ex-rights. Automatic Telephone issues have moved disappointingly to holders since declaration of the higher dividends; the price of the ordinary has dropped to 44s. ex-dividend. Enfield Rolling Mills have fallen 1s. to 15s. 3d., and Allen Wests a few pence to 6s. 6d. Among the shares to show improvement are English Electric, new 35s., Laurence Scott "A" 12s. 6d., Crabtree Industries 33s. 6d., and Ever Ready 32s. 9d.

Miscellaneous Matters

Marconi Marines have lately been a disappointing market on account of their failure to benefit from the bullish atmosphere of the market for shipping shares. After rising not long ago to over 40s., the price has fallen away to 33s. 9d., ex-dividend, together with hopes that this year's dividend would be an improvement on the previous rate of 7½ per cent. It is thought that a continuance of shipping activity should assure for the current year an expansion of profits more substantial than that shown in the accounts just published. Anglo-Portuguese Telephone shares have risen from 22s. 6d., at the beginning of this year, to 25s. 9d. now. The company has declared the usual 8 per cent. dividend and is proposing another capital increase. Globe Telegraph issues came into demand on news of the Cable and Wireless plan: the ordinary gained 10s. to 16¼, and the preference 2s. 6d. to 13⅜. London Transport "C" stock is unsettled by labour questions; the price is a point down at 89. British Electric Traction deferred hardened to 1500. Irregular conditions prevail in the iron and steel market, where Vickers dropped to 31s. on the foreshadowing at the annual meeting of a cautious policy for distribution of profits. Rubber shares suffered a slight setback in sympathy with the price of the commodity.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price. Apl. 6.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	72/6	+1/6	4 2 9
City of London	1	7½	7½	35/6	—	4 4 6
Clyde Valley	1	7	8	44/–	+1/6	3 12 9
County of London	1	10½	10½	51/6	+1/–	4 1 6
Edmundson's 7% Pref.	1	7	7	33/	—	4 10 0
Do. Ord.	1	8	8	42/6	+6d.	3 15 3
Elec. Dis. Yorkshire	1	9	9	44/6	+1/–	4 0 10
Elec. Fin. and Securities	1	12½	12½	2⅞	—	4 7 0
Elec. Supply Corporation	1	11	11	55/9	+⅛	3 18 7
Lancs Light and Power	1	7½	7½	34/–xr	—	4 8 3
Lond. Assoc. Electric	1	—	7	32/6	—	4 6 2
London Electric	1	7	8	36/–	+6d.	4 9 0
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	50/6	+1/6	3 19 2
Midland Counties	1	7½	8	2	+1/6	4 0 0
Mid. Elec. Power	1	8	9	2½xd	+¼	4 5 0
North Eastern Electric Ordinary	1	6	7	34/–	—	4 2 4
Do. 7% Pref.	1	7	7	34/–	—	4 2 4
Northampton	1	10	10	48/9	—	4 2 0
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	52/–	+9d.	3 17 0
Do. 6% Pref.	1	6	6	29/6xd	+6d.	4 1 4
Scottish Power	1	8	8	39/6	+6d.	4 0 10
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	43/6	+1/–	3 13 7
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	112	—	4 9 3
Do. 1955–75	„	5	5	113	—	4 8 6
Do. 1951–73	„	4½	4½	106½	—	4 4 6
Do. 1963–93	„	—	3½	97½	—	3 11 10
London Elec. Trans. Gtd.	„	—	2½	90	+½	2 15 7
London & Home Counties, 1955–75	„	4½	4½	110	—	4 1 10
London Passenger Transport, A	„	—	4½	113½	+1	4 0 0
Do. do. B	„	—	5	119½	—	4 3 8
Do. do. C	„	4½	4	89	−1	4 10 0
West Midlands Joint Elec. 1948–68	„	—	5	112½	—	4 9 0
TELEGRAPH AND TELEPHONE						
American Tel. & Tel.	$160	9	9	175½	—	5 2 9
Anglo-Am. Tel. Pref.	Stock	6	6	121xd	+½	4 19 4
Do. Def.	„	1½	1½	28½	—	5 7 2
Cable & Wireless 5½% Pref.	„	4½	5½	114	+2	4 16 6
Do. A. 7½% Ord.	„	Nil	Nil	29	−½	—
Do. B. Ord.	„	Nil	Nil	7½	−1½	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	16½	+½	2 15 5
Do. do. Pref.	10	6	6	13⅜	+⅜	4 8 0
Great Northern Tel.	10	20	20	42½	+½	4 14 3
Marconi-Marine	1	10	7½	1 11/16xd	—	4 8 9
Oriental Telephone Ord.	1	12*	12*	3 1/16	—	3 15 6
*** HOME AND FOREIGN TRAMS, ETC.**						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	4/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	20½	—	—
British Electric Traction Df. Ord.	„	5	5	1500	+25	—
Do. do. Pref. Ord.	„	8	8	165	—	4 15 5
Brazil Traction	$100	—	70 cts.	27⅛	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	104½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	4½	—	—
Do. 1st Bonds	$500	5	5	43½	+1	—
Victoria Falls Ord.	1	20	12	72/–	—	3 6 8
West Riding	1	6½	10	46/3	—	4 6 7
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	2⅝	—	5 4 4
Assoc. Elec. Ord.	1	8	10	51/–xd	+1/6	3 18 6
Do. Pref.	1	8	8	36/3	−9d.	4 8 3
Babcock & Wilcox	1	8	8	2½	+6d.	3 4 0
British Aluminium Ord.	1	7½	10	53/3xd	+9d.	3 15 0
British Insulated Ord.	Stock	20	20	6xd	—	3 6 8
Brush Ord.	Stock	Nil	Nil	52½	—	—
Callender's	1	15	15	4 1/16	—	3 5 9
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/–	12½	12½	70/–	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	3½	7	40/–	—	3 10 0
Enfield Cable Ord.	1	25	25	5 7/16	—	4 12 0
English Electric	1	Nil	Nil	35/–	+1/–	—
Do. do. Pref.	1	6½	6½	24/–	—	5 8 4
Ericsson Tel.	5/–	20	25	52/6	—	2 7 7
Ever Ready	5/–	35	35	32/9	+⅛	5 6 10
Ferranti Pref.	1	7	7	26/3	—	5 6 8
G.E.C. Pref.	1	6½	6½	31/3	—	4 3 2
Do. Ord.	1	10	15	87/–	—	3 9 0
Henleys	5/–	30	30	20/–	−3d.	3 15 0
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	22/6	—	4 17 9
Johnson & Phillips	1	7½	10	48/3	—	4 3 0
Lancashire Dynamo	1	10	20	3 7/16xr	−⅛	5 16 3
Siemens Ord.	1	5	6	35/–	—	3 8 7
Telegraph Construction	£1	Nil	7½	2½	—	3 6 8

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

18902. "Grid-control of ionic valves." Allmänna Svenska Elektriska Aktiebolaget. May 18th, 1935. (462385.)

19096. "Wireless communication systems." L. L. K. Honeyball. July 4th, 1935. (462459.)

19458. "Receivers for radio communication." Murphy Radio, Ltd., and A. Shackell. July 8th, 1936. (Addition 443423.) (462460.)

19480. "Electric circuits for reducing the effective shunt capacity introduced by circuit elements such as, for example, electric batteries." A. D. Blumlein. July 8th, 1935. (Cognate applications 25070/35 and 33805/35.) (462530.)

21520. "Methods of and means for depolarising primary cells and batteries." H. Muller and W. Stein. July 31st, 1934. (Cognate application 21521/35.) (462462.)

22291. "Synchronous motors." A. H. Neureuther. August 7th, 1935. (462660.)

22551. "Synchronous electrical machines." Dr. J. Lell. August 9th, 1935. (462661.)

24793. "Long distance high-frequency electric cables." British Thomson-Houston Co., Ltd. September 5th, 1934. (Cognate application, 24794/35.) (462532.)

24976. "Directional wireless systems." A. H. Cooper. September 7th, 1935. (462464.)

24977. "Thermionic-valve apparatus." E. L. C. White. September 7th, 1935. (462536.)

25068. "Method of and apparatus for the temperature compensation of cross coil instruments for use in remote measurement." Landis & Gyr Akt.-Ges. September 14th, 1934. (462667.)

25121. "Aerial and earth connections for wireless apparatus." Castle Fuse & Engineering Co., Ltd., and A. Bailey. September 10th, 1935. (462466.)

25161. "Alternators for electric power systems." British Thomson-Houston Co., Ltd., and D. E. Jewitt. September 10th, 1935. (462543.)

25164. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., and W. J. Scott. September 10th, 1935. (462545.)

25189. "Current-supply arrangements for operating electromagnetic relays." Automatic Electric Co., Ltd., T. P. Preist and G. W. Thompson. September 10th, 1935. (462547.)

25202. "Television transmission systems comprising mosaic screens." H. Miller. September 10th, 1935. (462550.)

25258. "Cathode-ray tubes." British Thomson-Houston Co., Ltd., H. W. H. Warren and W. J. Scott. September 11th, 1935. (462600.)

25273. "Electrical resistances." A. C. Cossor, Ltd., and F. Postlethwaite. September 11th, 1935. (462725.)

25326. "Electric distribution switchgear." A. Reyrolle & Co., Ltd., and G. D. Clothier. September 12th, 1935. (462677.)

25337. "Cycle dynamos." J. Lucas, Ltd., and A. Huyton. September 12th, 1935. (462678.)

25338. "Electrical equipments of motor vehicles." C.A.V.-Bosch, Ltd., and W. H. Glaser. September 12th, 1935. (462679.)

25340. "Electrical equipments of motor vehicles." C.A.V.-Bosch, Ltd., W. H. Glaser and N. R. Wood. September 12th, 1935. (462680.)

25385. "Cathode-ray tubes and the like." A. H. Gilbert, L. R. Merdler, G. R. Tingley and Baird Television, Ltd. September 12th, 1935. (Cognate application 26265/35.) (462683.)

25386. "Television and like apparatus." A. H. Gilbert, L. R. Merdler, and Baird Television, Ltd. September 12th, 1935. (462684.)

25438. "Electrical cooking apparatus." R. G. Tugendhat. September 13th, 1935. (462612.)

25457. "Electric lamps, vacuum discharge devices, and the like." General Electric Co., Ltd., and T. C. S. Page. September 13th, 1935. (462688.)

25463. "Current-control arrangements for electric spot-welding machines." British Thomson-Houston Co., Ltd. September 13th, 1934. (462729.)

25559. "Electric-discharge lamps." British Thomson-Houston Co., Ltd. September 15th, 1934. (462470.)

26341. "Loudspeakers." Parmeko, Ltd., and F. J. Toone. September 23rd, 1935. (462397.)

26991. "Prepayment meters for electricity, gas and the like commodities." N. Wright and Metropolitan-Vickers Electrical Co., Ltd. September 30th, 1935. (462610.)

27597. "Radio receivers." E. K. Cole, Ltd., and G. Bradfield. October 7th, 1935. (462475.)

31419. "Sealing of electrical conductors through quartz envelopes." General Electric Co., Ltd. (Patent Treuhand-Ges. für Elektrische Glühlampen). November 13th, 1935. (462485.)

31891. "Air-cooling arrangements for electric current convertors." Siemens-Schuckertwerke Akt.-Ges. December 19th, 1934. (462619.)

32280. "Electric light fittings." J. J. Fenn and Benjamin Electric, Ltd. November 21st, 1935. (462620.)

32889. "Receiving sets for television and the like." General Electric Co., Ltd., and D. C. Espley. November 27th, 1935. (462488.)

32890. "D.c. amplifiers." General Electric Co., Ltd., and D. C. Espley. November 27th, 1935. (462564.)

33710. "Electric insulators." W. W. Triggs (Ohio Brass Co.). December 5th, 1935. (462624.)

34687. "Magnetos." Wico Electric Co. January 17th, 1935. (462567.)

36064. "Electrical measuring instruments, more especially standard meters." Landis & Gyr Akt.-Ges. January 16th, 1935. (462491.)

1936

1151. "Aerial leads for radio reception." K. C. Bridges. January 14th, 1936. (462571.)

4808. "Cathodes for electron-discharge devices." Radio Corporation of America. February 23rd, 1935. (462706.)

6068. "Television." Radioakt-Ges. D. S. Loewe. March 1st, 1935. (462416.)

7123. "Electric circuit-interrupters." Westinghouse Electric and Manufacturing Co. March 8th, 1935. (462495.)

7408. "Electric cables." Soc. Anon. Ing. V. Tedeschi & Co. April 19th, 1935. (462496.)

9037. "Radio wave signalling systems." Wallace & Tiernan Products, Inc. June 11th, 1934. (Divided out of 16197/35.) (462454.)

9903. "Electric fuses." British Thomson-Houston Co., Ltd. April 3rd, 1935. (462577.)

10268. "Variable electric condensers." British Thomson-Houston Co., Ltd. April 12th, 1935. (462423.)

10747. "Electric-discharge devices." British Thomson-Houston Co., Ltd. April 16th, 1935. (462500.)

12183. "Electric current collecting devices having laminated contact paths." Siemens-Schuckertwerke Akt.-Ges. May 14th, 1935. (462578.)

12707. "Electrode systems for rectifying and controlling high and medium frequency electrical oscillations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 29th, 1935. (462579.)

14056. "Multi-grid electric-discharge tubes and circuits comprising such tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 14th, 1935. (462428.)

14295. "Gas-filled electric incandescent lamp and process for its manufacture." Vereinigte Glühlampen und Elektricitats Akt.-Ges. May 20th, 1935. (462430.)

14710. "Electric switches." Igranic Electric Co., Ltd. June 13th, 1935. (462505.)

16239. "Arrangement of electrode wires or threads in electrical gas purifiers and similar arrangements." W. W. Triggs (Bolidens Gruvaktiebolag.) June 10th, 1936. (462637.)

16668. "Electric condensers." Porzellanfabrik Kahla. June 15th, 1935. (462639.)

18754. "Reduction of the effects of unwanted reactance introduced in electric circuit arrangements by certain circuit elements." A. D. Blumlein. July 8th, 1935. (Divided out of 462530.) (462583.)

18864. "Electric circuits for reducing the effective shunt capacity introduced by circuit elements such as, for example, electric batteries." A. D. Blumlein. July 8th, 1935. (Divided out of 462530.) (462584.)

19579. "Modulated carrier wave communication systems." J. M. D. Dekker. July 14th, 1936. (462436.)

23068. "Electron-discharge devices." Standard Telephones & Cables, Ltd. October 31st, 1935. (462647.)

23915. "Electric contacts." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. February 15th, 1936. (462442.)

25046. "Radio wave signalling systems." A. H. Stevens (Wallace & Tiernan Products, Inc.). June 4th, 1935. (Divided out of 16197/35.) (462455.)

25052. "X-ray apparatus for crystal analysis." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 17th, 1935. (462522.)

26566. "Electric meters." British Thomson-Houston Co., Ltd. October 1st, 1935. (462443.)

26668. "Electric regulating apparatus." British Thomson-Houston Co., Ltd. October 1st, 1935. (462524.)

29057. "High-frequency electric oscillators." British Thomson-Houston Co., Ltd. October 25th, 1935. (462447.)

29773. "Mercury and like conducting liquid switches." British Thomson-Houston Co., Ltd. November 1st, 1935. (462527.)

34812. "Electric batteries." Chloride Electrical Storage Co., Ltd. (Accumulatoren-Fabrik Akt.-Ges.). December 18th, 1936. (462450.)

34882. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 21st, 1935. (462451.)

1937

22. "Wireless communication systems." L. L. K. Honeyball. July 4th, 1935. (Divided out of 462459.) (462529.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 31st.

Alizal. No. 574945. Class 13. Electric lighting, heating and power fittings and parts thereof, all made of ordinary metal.—The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.

Syneit. No. 573591. Class 14. Electro-plate.—James D. Brown and Robert Morrison, trading as Brown & Co., 116, West Nile Street, Glasgow.

I.E.E. Centre Reports

The annual report of the Scottish Centre of the Institution of Electrical Engineers shows the local membership to be 777 (428 corporate). The average attendance at meetings was only 57; the annual dinner attracted 400 and the summer meeting 204. The Dundee Sub-Centre membership is 93 (46 corporate). Attendance at meetings increased appreciably, averaging 40. The Scottish Students' Section membership decreased by 27 to 182 and attendance fell also to 28 per meeting.

The South Midland Centre membership increased by 140 to 1,687 (722 corporate). Attendance at meetings averaged 136, with 367 at the dinner and 29 at seven visits to works, &c. The summer visit to the B.T.H. works at Rugby attracted 127. The Pirelli-General Cable Works at Eastleigh are to be visited on July 1st. The average attendance at the East Midland Sub-Centre meetings was 84.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Altrincham.—Houses (50), near Hales Road, Hale; Sparke & Stephens, Ltd., builders, Maudeth Road, Heaton Mersey.

Axbridge (Somerset).—Court house buildings, including two court rooms, two magistrates' retiring rooms, solicitors' room, &c., for the Somerset Standing Joint Committee; A. T. Toomer, county architect, Taunton.

Banbury.—Additions to Norton hospital (£60,000); C. Burns, architect, Tunbridge Wells.

Bedworth.—Houses (100), Wootton Street-Marston Lane site; Public Works Building Construction Co., Swindon.

Belper.—Hosiery factory, Penn Street, for F. Blount, Allestree.

Birmingham.—Houses (180), Lea Hall estate (£57,968), welfare centre, Brays Road, Sheldon, and enlargement of Little Bromwich hospital (£102,473); city architect.

Bolton.—Houses (264), Long Lane estate (£89,212); Phœnix Construction Co. (Manchester), Ltd. Municipal Technical College; Lanchester, Lodge & Davis, architects, 19, Bedford Square, London, W.C.1.

Bridlington.—Houses (22); Aldridge, Clark & Co.

Bucknall (Staffordshire).—Houses (142), Eaves Lane, for G. & A. Seddon, Ltd.; A. Glyn Sherwyn, architect.

Chadderton.—School, Mills Hill (£17,470), for E.C.

Chelmsford.—Houses (50), near Broomfield Road; W. J. Wade. Factory, Writtle Road; British Challenge Glazing Co., Ltd.

Cheltenham.—Houses (29); E. H. Rosser, building surveyor, 14, Imperial Square. Cinema, on the site of Imperial Rooms; Associated British Cinemas, Ltd. Factory, Whaddon estate; Walker, Crossweller & Co.

Chepping Wycombe.—Houses (40), Long's Meadow site; T. J. Rushbrooke, borough surveyor, High Wycombe.

Chester-le-Street.—Houses (72), Pelton Fell (£25,660); W. Ridley, U.D.C. surveyor.

Chichester.—Houses (34), Clay Lane, Fishbourne; F. C. Nash, city sanitary inspector, Council Offices, North Street.

Coseley.—Houses (94), Park Hill Road; A. & J. Mucklow, builders, High Street, Blackheath.

Croydon.—Factory, Purley Way, for the County Commercial Cars, Ltd.

Dagenham.—Houses (73), Fourth Avenue; J. Blade, builder.

Darton (Near Barnsley).—Houses (130), New Road, Staincross; U.D.C. surveyor, Council Offices.

Dodworth.—Houses (104), Barnsley Road; U.D.C. surveyor, Union Chambers, Royal Street, Barnsley.

Doncaster.—Sandringham school, for E.C.; H. A. Johnson, of T. H. Johnson & Sons, architects, 20, Perry's Place. School, Wheatley; H. A. Hickson, architect, Hallcroft Chambers, Hallgate.

Dringhouses (Yorkshire).—Houses (42), Northfield Terrace; W. J. Simpson.

Dudley.—Factory, Thompson Avenue, for the Valeting Service, Ltd., Newtown, Cradley Heath.

Eastbourne.—Cinema, Junction Road; Union Cinemas, Ltd.

Edmonton.—Factory, Nightingale Road for the Fleetway Manufacturing Co. Ltd., 13, St. Andrews Street, London, E.C.4.

Essex.—Hospital, Chadwell Heath (£255,021), and extensions to Senior school, Rainham (£12,045); county architect.

Exeter.—Terminal buildings, the Aerodrome, Honiton Clyst; R. H. Dymond, city engineer, Municipal Offices, Exeter.

Felixstowe.—Pier concert hall (£11,900); U.D.C. surveyor.

Flintshire.—Additions to the Rhyl County school, for County E.C.; R. G. Whitley, country architect, County Buildings, Mold.

Gateshead-on-Tyne.—Factory for the Rivet, Bolt and Nut Co., 74, York Street, Glasgow, C.2. Child welfare and maternity centre; A. V. Clerey & Sons, builders, 14, Frederick Street, Sunderland.

Glamorganshire.—Police station and court, Maesteg (£13,389); county architect, County Hall, Cardiff.

Gloucestershire.—School, Longlevens (£16,945), for County E.C.; J. Simmonds, builder, Gloucester.

Grays (Essex).—Cinema, George Street, for Fredericks' Electric Theatres, Ltd.

Great Barr.—Cinema, Walsall Road, for Lyon, Clark & Co., High Street, West Bromwich; P. W. Cox, Ltd., builders, Grove Lane, Birmingham.

Halifax.—Extensions to Theatre Royal, for the Northern Theatres Co., Ltd.

Hanley.—Extensions to Etruria works; Wengers, Ltd. Reconstruction of premises, Piccadilly; Gaumont British Picture Corporation.

Hawarden.—Houses (104), Shotton and Caergwrle; surveyor, Council Offices.

Heywood (Lancashire).—Cinema at the junction of St. James' Street and Bridge Street (stadium type), for the Union Cinemas, Ltd. Cinema, Church Street (£35,000), for the Picturedrome (Heywood), Ltd.

Holywell.—Cinema, Coleshill Street, for the Deeside Enterprise Cinemas, Ltd., Rhyl; S. Colwyn Foulkes, Central Chambers, Colwyn Bay.

Hull.—Houses (166), Bilton Grange estate, Marfleet Lane; city architect. Houses (181), near Southcoates Lane; Alexandra Land Co., Ltd. Factory for the Blackburn Aircraft, Ltd. (£75,000); Kettlewell, Son & Co., Ltd., builders.

Irish Free State.—(Arklow, Co. Wicklow).—Houses (90); J. P. Caffrey, town surveyor, Courthouse, Arklow. (Wexford).—Town Hall; E. Donnelly, 14, Lower O'Connell Street, Dublin, and C. J. Morris, joint architects.

Irlam (Lancashire).—Houses (112), near Ferry Road; Bolam Estates, Ltd.

Kent.—School, Sideup (£46,841); county architect, Sessions House, Maidstone.

Leeds.—Office buildings for the River Ouse (Yorkshire) Catchment Board, Central Bank Chambers, Infirmary Street, Leeds, 1; V. Bain, architect, Woodlands Gate, Harrogate.

Lichfield.—Houses (28), Handsacre and Hopwas; R.D.C. surveyor.

Liversedge (Yorkshire).—Houses (100) and shops, Corn Mill Lane; G. A. Schofield.

London.—(Lambeth).—Factory, Gray Street, for David Greig, Ltd., 22, Webber Street, S.E.1.

Longbenton.—Houses (7½-acre site), Burradon; U.D.C. surveyor.

Maesteg.—Houses (40), Park estate; E. Davies, surveyor, Council Offices.

Maidenhead.—Flats (248), Braywick Road; A. C. Cowtan, architect, 54, Warwick Square, London, S.W.1.

Malden (Surrey).—Houses (50), Franks Avenue site; A. R. Goldthorp, borough surveyor.

Manchester.—Factory, Waterloo Road and Allison Street, Hightown, for M. J. Almond & Co., Ltd., 44, Derby Street, Cheetham; Normanton's, Ltd., builders, 167, Plymouth Grove, Chorlton-on-Medlock.

Margate.—Extensions to Drapers Mills and Garlinge schools (£33,000), for E.C.

Middlesex.—School, Pinner (£36,000), for County E.C.; E. D. Winn & Co., builders.

Newcastle-on-Tyne.—Houses (54). Fawdon Lane, for the C.C.; W. H. Browse, builder, Church Way, North Shields. Church, Heaton, for the Newcastle Presbytery; Tasker and Child, architects, Trinity Buildings, New Bridge Street, Newcastle-on-Tyne.

Newmains.—Factory for the Coltness Iron Co., Ltd., and Imperial Chemical Industries, Ltd., Millbank, London, S.W.1.

Northampton.—Houses (90) and shops, Duston Road; A. & F. Gale, Ltd. Houses (82), Fullingdale Road; Lucas (Moulton), Ltd. Development of Kingsthorpe Hill estate; T. Wilson & Son, Ltd. Offices, Weedon Road; Express Lift Co., Ltd.

Norwich.—Houses (297); borough surveyor.

Nottingham.—Factory and houses, Mansfield Road and Redhill, Arnold; G. Rose, builder, Eakring Road, Mansfield.

Nuneaton.—Houses (33), Vernons Lane estate (£11,845); E. Savage, builders.

Oldbury.—Houses (128), Holt Farm estate, Penncricket; borough surveyor, Municipal Chambers.

Peterborough.—Houses (300), Werrington, for employés of Peter Brotherhood, Ltd.

Preston.—Cinema, Church Street, for the directors of the Palladium Cinema; G. E. Tonge, architect, National Provincial Bank Chambers, Lord Street, Southport.

Rickmansworth.—Houses (52), Mill End; U.D.C. surveyor.

Runcorn.—Houses (82), four contracts, Ivy Street site; A. B. Cunningham, U.D.C. surveyor.

Seaton Valley.—Houses (58); W. Turner, 23, Oaktree Avenue, Walkerville, Newcastle-on-Tyne.

Sheffield.—Houses (57), Barncliffe Crescent; Simpson Bros., Ltd. Houses (30), Stephen Hill; T. V. & W. L. Simpson. Cinema, Beck Road; J. F. Emery Film Circuit. School (£54,799), for E.C.; T. Roper & Sons, Ltd., builders. Large extensions (second portion) to engineering works, Darnall, for Davy Bros., Ltd., Park Iron Works; George Longden & Sons, Ltd. builders Neepsend.

Somerset.—Bishop Fox's Girls' school, Taunton, for County E.C.; A. J. Toomer, county architect, Park Street, Taunton.

Southend-on-Sea.—School, Carlton Avenue (£36,545), for E.C.

South Shields.—Houses (1,000), seven areas in connection with the T.C.'s five years' rehousing plan; borough engineer.

Stamford (Lincolnshire).—Cinema, Broad Street; G. Cole, architect, 40, Craven Street, Strand, London, W.C.2.

Stockport.—Extensions to Technical college (£15,400), for E.C.

Stoke-on-Trent.—Houses (64), Cornhill estate; city architect. Houses (32), North Street; Holloway & Co.

Sunderland.—X-ray block, Municipal Hospital; borough engineer.

Swindon.—Estate development, Marlborough Road; E. H. Bradley & Sons. Hotel, Drove Road; Fleetwood, Eversden & Partners. Extension to factory, Newcastle Street; R. J. Beswick & Sons.

Thetford.—Houses (22), Barry Road; S. J. Waring, architect, 3, Redwell Street, Norwich.

Tunstall.—Houses (36), Huntilee Road; W. Durose. Houses (74), near Ridge Road; G. L. D. Bates.

Tyldesley.—Houses, near Ley Road and Astley Street; F. E. Jones, U.D.C. surveyor.

Walsall.—Factory, Bescot Crescent, for Matchett and Martineau, Ltd., 260, Bradford Street, Birmingham; British Steel Construction, Ltd., architects, 205, Corporation Street, Birmingham. Factory, for Smith, Bayliss & Nettlefold, Ltd.; Deacon & Boardman, builders, Algernon Street.

Warlingham (Surrey).—Shops and flats, Hamsey Green; South Suburban Co-operative Society, Ltd.

Welshpool.—Cinema, for H. S. Bayliss; A. H. Guest, Ltd., builders, Coalbourne Brook, Stourbridge.

West Bromwich.—Houses and bungalows, Greets Green estate, Hamstead; D. Ellison, surveyor, Town Hall, West Bromwich. Buildings, for Kenrick Technical college; T. Spencer Wood, architect.

Willenhall.—Factory, for John Harper & Co., Albion Works; Deacon & Boardman, builders, Algernon Street, Walsall.

Worthing.—Houses (24), Jupps Lane; Wignall & Ainsworth. Houses (23), Stone Lane; Sands & Co.

Yarm (Yorkshire).—Houses (22); R. P. Brotton (junior), architect, Chopgate, Middlesbrough, Yorkshire.

York.—Houses (28), Beech Avenue; Ainstey Building Estates. Houses (333) and flats, Water Lane estate, and municipal offices, Castle site (£111,300); city architect.

Yorkshire.—School, Conisborough, for West Riding E.C.; county architect, Wakefield.